Author's response to reviews

Title: The impact of rheumatoid arthritis on foot function in the early stages of disease: a clinical case series

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Author's response to reviews: see over
Reply letter to reviewers report

Reviewer: Karen Lohmann Siegel

Thank you for your valuable comments which have improved the precision and strengthened the overall quality of the paper. We have undertaken all the major compulsory revisions, minor essential revisions and discretionary revisions and explain these in detail below in the order presented to the authors:

Compulsory revisions
1) Methods
We have provided further detail on p6, par 2 for the dependent measures reported including sign convention and definition. WE have followed this through to Figure 1 both in the graphs and the Figure heading.
   a) We have defined the initial foot contact angle more precisely. You are correct in that it is the angle formed between the whole foot segment and the floor and the sagittal plane, the foot-to-floor angle.
   Thank you also for pointing out the serious error in Figure 1 with respect to the zero angle during midstance. This indeed should be zero and we appear to have pasted in a figure used in an earlier draft of the paper prior to submission. In the figure presented here the ‘offset’ was created because of the way the foot segment coordinate system had been built. We corrected this and recalculated the angles but clearly forgot to make the change in Figure 1. Consequently we have also made changes in Table 2, for the initial foot-to-floor contact angle and to define the plantarflexion variable as terminal stance heel rise. The make Figure 1 more understandable for clinicians reading this paper we have adopted the graph format presented in O’Connell et al. 1998, specifically the use of foot models to show the sign convention for each variable.
   b) Changes have been made to refer to this variable as terminal stance heel rise in the text, Figure 1 and Figure 1 heading and in Table 2.
   c) The CoP has been changed to avoid the use of “duration”. We have changed this to “time as a % of stance”. Furthermore, we have referenced this measurement to the plantar pressure analysis where the metric is extracted from.
   d) We have clarified that peak eversion was extracted from the movement of the rearfoot relative to the shank. We have also added the sign convention. We have also clarified definition of navicular height.
   e) We have defined more clearly the region of interest for the forefoot.
   f) We have defined more clearly the region of interest for the lesser toes.
   g) we have defined more clearly the region of interest for the midfoot.

2) Results/discussion
We agree that the rationale for focusing on individual cases is not established in the study. Our intention, with a small group of patients was to demonstrate individual examples of severe functional loss in the early stages to illustrate the importance of the approach. However on reflection we can see how specific selection of different cases linked to different variables detracts from the overall findings of the study. Consequently
we have removed the individual cases from the graphs in Figure 1, and the explanation for these in the figure heading. We have also omitted figure 2.

3) Discussion
We have added a paragraph addressing the key study limitations. We have focused on the key concern of the reviewer, that of patient selection bias but also added commentary on sample size and system accuracy (with respect to measuring changes in small joints of the foot).

4) Fig 1C. We acknowledge an immediate error in Figure 1C in that the cross-reference to the patient in Table 1 should be Pt # 10. We have corrected this. We went back to our data to check the vertical ground reaction forces for this patient. Firstly, the processing in Visual3D appears to be correct in terms of the normalisation to BW. Secondly, we reviewed the gait as a whole and noted that the patient was walking slowly at 0.66m/s with a double-support time (as % of gait cycle) of 29.4%. She was obese with a BMI of 38.9. Her overall gait pattern was abnormal with an obvious asymmetrical body weight distribution (favouring the right side). Her left ankle and subtalar joints were stiff and tender on examination and her rearfoot motion was inverted during stance. She did not use a stick but lifted her arms outwards during gait. We are of the opinion she was compensating generally by walking slower and then specifically weight transferring to the right side during the loading response to off-load a painful and stiff left ankle/subtalar region.

Given the approach to remove the individual cases from the paper, Figure 1C has been changed.

Minor essential revisions
5) The abstract has been changed to reflect the aim of the study as outlined in the introduction.
6) To explain the choice of data analysis we have changed the final sentence in the abstracts method section to read, “For this small sample, the mean differences between the groups and associated confidence intervals were calculated using the t distribution”.
7) The word “significant” has been changed to “clinically important”.

8) To clarify the model definition we have made changes to the paragraph at the top of page 6. Firstly, we limited the segment definition for the multisegment model as the shank, rearfoot, forefoot and hallux as described by Carson. We have then added the following sentence which introduces the single foot segment and reason for creating this, “To permit calculation of ankle joint moments and power we also created a single foot segment”.

9) We have clarified that the time for CoP was 44% “of stance”.

10) We have clarified the sign convention in Table 2 and Figure 1.

Discretionary revisions
Abstract
11) “of” deleted and 12) “higher” replaced with “greater”.

13) Discussion: the correct reference has been added.
Reviewer: Keith Rome

Thank you for your valuable comments which have improved the precision and strengthened the overall quality of the paper. We have undertaken all the suggested revisions and present these below in the order presented to the authors.

Specific:
Page 2: We have inserted RA before patients.
Page 2: We have changed ‘significant’ to ‘clinically important’.
Page 5: The disease duration was defined from onset of symptoms. We did not use fulfilment of the ACR criteria since this frequently delays diagnosis. Many patients are treated as RA in Early Arthritis Clinics on the basis of the ‘therapeutic window of opportunity’ paradigm. Accordingly we have refined the definition in the text.
Page 5: As the reviewer will appreciate, the methodology here is quite extensive so attempted to limit the detail provided for clinical procedures which are largely standardised within Rheumatology practice. However we have provided more detail for the swollen, tender and painful joint counts, for the Leeds Foot Impact Scale and for the structural index.
Page 5: We have expanded on the goniometric measurement of the varus/valgus alignment of the heel by stating that ‘a standard hand held goniometer was used’. Unfortunately we are unable to provide manufacturer details. We keep the references in place which provide more detail on this technique.
Page 5: Earlier in the methodology we have now provided a fuller explanation of the Leeds Foot Impact Scale. In table 1 we have added the scoring range for each of the two scales in the table legend. We have provided a range of values in the results section to clarify our definition of low/moderate/high scores for each subscale. We could not find any reference to a severe score as you suggest?
Page 10: We did not investigate using statistical tests the relationship between impairment, disease activity and function. We did seek to identify trends only.
Page 10: We have changed “high” to moderate-high but this was observed in more than 3 patients. There were 3 patients with high disease activity but we were referring in this sentence to high disease impact- disease impact as measured by the Leeds Foot Impact Scale.
Page 10: We have removed reference to unpublished work.
Page 10: We accidentally omitted a reference to our Leeds Foot Impact Scale development paper which shows this association.
Page 12: We have added a reference here.
Page 12: We have made it clear that the prevalence is for RA.
Page 12: The section relating to localised disease activity and valgus heel posture has been revised. In the same section we have also changed the reference to the 2 varus heel patients.
Page 12: Weak in this context refer to muscle strength when tested by manual muscle strength techniques. We have changed the sentence to clarify this.
Page 13: The median disease duration relates to the earlier study reported and we have changed the sentence to make this clearer.
Table 1: The table contains a mixture of right and left feet since we randomly identified one foot to study. We did not want to artificially raise the sample size by measuring both, nor was the rationale to study interactions between left and right. Between the results section on page 6, sub-section demographics and clinical characteristics we have provided all the demographic information for the non-RA cases. There simply isn’t enough space in Table 1 to provide all this information so we have left this unchanged.