Reviewer's report

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

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Reviewer: Karen Lohmann Siegel

Reviewer's report:

General

The authors have addressed an important topic of changes in foot function during locomotion within the first two years of a diagnosis of rheumatoid arthritis. While changes in foot function later in the disease course are well documented, available data are much more limited early in the disease. The results provide valuable insight to rheumatologic clinicians, particularly those who are skeptical of foot involvement early in the disease course. The research approach also is sound with dependent variables coming from all areas of the ICF disability model – measures of foot structure and function as well as activity and participation, which makes this paper an especially valuable contribution to the literature. However, there are some areas which could be revised to strengthen the paper and are described in more detail below. This includes clearly defining and consistently reporting the dependent measures throughout the text, abstract, and figures, closely relating the presented data to the study aims, and adding a section in the discussion on the study limitations.

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

1) Methods, p 6, par 2
More detail is needed to define the dependent measures reported in the study and the sign convention should be explicitly stated where applicable. This need not be a lengthy explanation because references to the method are provided, but some detail is necessary for the paper to be understandable on its own. 

a) Initial foot contact angle (also seems to be the variable reported in Fig 1A)
   The angle represented needs to be better defined. It appears to be the angle between either the one segment foot or the rearfoot of the 3 segment foot and the floor in the sagittal plane. The Fig 1A caption describes it as ankle dorsi/plantar flexion, but this does not appear correct based on the motion pattern presented. It appears to be more accurately described as foot-to-floor angle on page 9. If the graph is foot-floor angle, the period of nearly zero slope at midstance should correspond to foot flat and therefore an angle of zero in Fig 1A. Why doesn’t it? More explanation is needed in the text to define this variable, and then it should be referred to consistently throughout the text.

b) Terminal stance plantar flexion
   This also appears to be the same variable reported in Fig 1A in which case it may be more appropriate to call it terminal stance heel rise as is done on p 9 rather than ankle plantar flexion as is done in other locations in the text. Again, the variable needs to be better and more consistently defined in the text, abstract, and figure caption.

c) Duration of center of pressure at 50% of foot length
   The term “duration” is confusing. Table 2 suggests this variable is the time as a % of stance when CoP progressed forward to 50% of foot length. This is a clearer description than “duration”. Also clarify whether this is referring to the 1 segment or 3 segment foot.

d) Peak eversion motion
   Clarify at which joint or between which two segments eversion refers. I assume it is the rearfoot relative to the tibia, but please state this explicitly.

e) Peak forefoot pressure
   Does this include the region of the MT heads only, or all anterior regions of the foot including MT heads, lesser toes, and hallux? (I realize the area of peak pressure likely will occur under the MT heads even if the region includes the toes, especially of the subjects with RA, but it should be explicitly stated.)

2) Results/Discussion
   The authors have stated that the study aim is to describe disease activity, impairment, disability, and foot
function in early RA and they do this for the group of 12 subjects in the discussion section. However, in the results section, they also present some subject-specific data. The rationale for their data selection is not clear (p 7). Foot impairment data are presented by level of disease activity (p 8). From the gait and plantar pressure analysis, data from 5 different subjects (1, 2, 3, 8, & 11) are presented for 5 different variables in the figures. This approach prevents a comprehensive picture of any one subject from being developed and does not appear to support the paper’s aim of relating the various measures of disease activity, impairment, disability, and foot function (p 4) when subject-specific data each come from a different subject. The authors should clarify their rationale for presenting the subject-specific results so it is more consistent with the study aims.

3) Discussion
This study identified the important possibility of substantial limitations in foot function occurring even early in the course of rheumatoid arthritis. While the authors appropriately noted the need for additional study (p 13), they also should address study limitations. One important area to include is subject selection bias. Not any patient with RA of less than 2 years duration was studied, only those with foot problems requiring referral to a podiatrist with expertise in rheumatology were included, which may represent a subset of patients with the most severe foot involvement. This should be addressed.

4) Fig 1C
The vertical ground reaction force for Pt #11 is below body weight for nearly all of stance phase. This is a paradoxical finding given that the methods section does not report any subjects using gait aids. The authors should reexamine their data for errors or perhaps the normalization approach is not as straightforward as it seems.

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

Abstract
5) The study purpose stated in the abstract is narrower in scope than that stated in the introduction. Please edit for consistency.
6) In methods, consider noting that hypothesis testing was not performed due to small sample size to justify the choice of data reported in the results section.
7) Use of the word significant in the conclusions implies hypothesis testing, which was not performed. Consider alternative term such as meaningful or noteworthy, which does not have statistical connotation.

Methods
Because of the overlapping foot models, a bit more emphasis on operational definitions at the top of page 6 may be helpful. The term “foot” could refer only to the 1 segment foot, and the terms rearfoot, forefoot, and hallux for the 3 segment foot. Regardless of the approach, it should always be clear to the reader which segments or model is being used to calculate each of the reported variables and that is not always the case currently.

Gait Analysis Results
p 9, 3rd line from bottom
Clarify that time for CoP to reach 50% of foot length is 44% "of stance".

Table 2 and Figure 1
Clarify the sign convention for all variables as appropriate – angles, moments, forces, powers, etc.

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Discretionary Revisions (which the author can choose to ignore)

Abstract
11) In results, “of” in first line can be deleted or another word may be missing. 12) Halfway down, consider use of word “greater” instead of “higher” to describe eversion, so it seems consistent with, not opposite to, the finding of lower medial arch height.

Discussion
P 12, par 2, line 3
What next?: Unable to decide on acceptance or rejection until the authors have responded to the major compulsory revisions

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

Quality of written English: Acceptable

Statistical review: No

Declaration of competing interests:

I declare that I have no competing interests