Reviewer’s report

Title: Musculoskeletal application and validation of speckle-tracking ultrasonography

Version: 0 Date: 06 Dec 2018

Reviewer: Joseph Sarver

Reviewer's report:

Introduction:

1. The authors have done an adequate job reviewing the literature to justify the need for their study.

Methods:

The methods has several sections that are inadequate and need SIGNIFICANT revision before this manuscript can be published. Specifically:

1. Strain

   a) The authors refer to sarcomere strain, but such structures are not in the same scale as the US measurements used to determine strain. At best, the authors are measuring tissue strain.

   b) The authors description of how strain was determine was wholly inadequate. To begin with, muscle is a very complex tissue, with 3D strain. The impact of their simplification to 1D strain was not discussed in sufficient detail. Next the authors given no description of how the software determines strain. At a minimum, strain is a change in length over initial length. What initial length? What length change was determined? Without this background information, it is impossible to assess the quality of the results. While the authors do describe that the strain measures are proprietary from the device used, this is insufficient explanation for a scientific paper. Without knowing those details, it is the duty of the authors to evaluate the strain accuracy, which could be done with phantoms.

   c) Furthermore, given that motion of the probe relative to the muscle, or the scapula relative to the probe would dramatically affect the results, the authors need to state how such potential noise values were taken into account. That is, from an image analysis point of view there is no different between the muscle moving relative to the probe (either due to contraction, or scapular motion), or the probe moving relative to the muscle.) Without accounting for such 'artifact' motion, it is not possible to assess the accuracy of the results.
Results:

The results were presented clearly presented, captions were appropriate, figures were clear and presented in a clear manner.

Discussion:

1. Paragraph 1

a) With high degree of accuracy is incorrect. Accuracy would imply they compared their measurements of strain to a gold standard, which they have not. They found correlations between MVC and measured strain, further work is necessary to consider these strains 'accurate'.

2. Paragraph 2

a) The authors state they "measure tension directly". This is incorrect. If accurate, which remains to be seen, at best their method could measure muscle strain, which is not the same as muscle tension. The relationship between a strain and tension (or stress), in a dynamic, non-linear, viscoelastic, an-isotropic materials such as muscle is extremely complicated to suggest otherwise is simply incorrect.

3. Paragraph 4

a) Strong correlation does not, as the authors suggest, validation was achieved successfully. At best the correlation, which was for limited range of MVC, supports the hypothesis that the, for a given arm orientation, and under isometric conditions, as the force produced at the hand increased, the tissue displacement increased. This is by no means, validation.

4. Paragraph 5

a) The authors describe many of the limitations in existing techniques, but fail to address the many limitations of their study within the same context. For example, they point out some of the limitations in shear wave elastography (SWE), another ultrasound technique, but fail to mention that probe orientation, probe motion and operator experience are also a limitation in their technique. At no point, did they repeat their experiments to see if they have the same findings on a different day, or with different people, or under a myriad of other conditions that would affect the repeatability and reliability of their technique.
Conclusion:

1. The authors state that measuring muscle deformation 'will' influence future studies, but they provide no evidence that this will be true. They show no difference between groups (healthy and control, or fresh vs fatigued muscle, or …). While their results are interesting, this is only a first step in a long road toward that goal, and their wording should make it clear that this is well understood.

Are the methods appropriate and well described?
If not, please specify what is required in your comments to the authors.

No

Does the work include the necessary controls?
If not, please specify which controls are required in your comments to the authors.

Yes

Are the conclusions drawn adequately supported by the data shown?
If not, please explain in your comments to the authors.

No

Are you able to assess any statistics in the manuscript or would you recommend an additional statistical review?
If an additional statistical review is recommended, please specify what aspects require further assessment in your comments to the editors.

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