Reviewer’s report

Title: The combined impact of mechanical factors on the wall stress of the human ascending aorta - a finite elements study

Version: 0 Date: 24 Oct 2017

Reviewer: Giulia Luraghi

Reviewer's report:

The authors present a structural finite element analysis to study how different factors, such as material properties and loading conditions, influence the stress filed in the wall of a non-dilated aorta, an aorta with aneurysm of the ascending part and an aorta with an aneurysm in the aortic root. They built three different simplified geometries to model physiological and pathological cases. They modelled the material of the aorta with a linear elastic law and, in case of an aneurysm, they investigated the consequence of increasing the elastic modulus in the aneurysm site. Two different type of loading conditions were explored: a blood pressure of 120 mmHg or 160 mmHg and different values of longitudinal up-and down movement of the aortic root (0, 5, 10 and 15 mm).

They identified the areas of the maximal stress in all the models. They observed the influence of each factor and they conclude that:

- The models with higher elastic modulus had higher stress values;

- An increment in blood pressure caused an increment in the peak wall stress;

- Systolic aortic stretching caused a significant increase in the peak wall stress.

- The highest wall stress was observed in the model representing the aneurysm in the ascending aorta.
Main comments:

1) The results on the comparison with different elastic modulus and loading conditions are obvious and the simulations do not provide further information.

2) The only relevant result is the comparison between different location of the aneurysm, but the idealized and simplified geometry makes unsatisfactory the conclusion. In fact, the effect of the geometry should be investigated in a reconstructed patient-specific model.

3) The assumption of rigid wall makes this study too simple. A Fluid-Structure interaction approach should be encouraged, to bring some novelty in this field.

8. Without a verification/validation using patients' data, this work remains as a theoretical view. The clinical inference of such a study should be reported and discussed with real life cases.

Minor comments:

Line14: instead of "the aortic wall elasticity was decreased", please use "Young Modulus was increased".

Line17: allows

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.

Unable to assess

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.

Not relevant to this manuscript

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Please indicate the quality of language in the manuscript:

Acceptable

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