AORTIC LOCAL BIOMECHANICAL PROPERTIES IN THE CASE OF ASCENDING AORTIC ANEURYSMS

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Introduction

Abstracts must comply with the format described below. The ascending aortic aneurysms (AsAA) is a high-risk cardiovascular disease with an increased incidence over years. The impact of the risk factors (age, gender, smoking, hypertension, obesity, aortic valve disorder, coronary artery disease, etc.) remains unclear (Erbel et al. 2015). In this study, we compare different risk factors based on the pre-failure behaviour (from a biomechanical point of view) obtained ex-vivo from an equi-biaxial tensile test.

Methods

A total of 100 patients (63 ± 12 years, 72 males) with AsAA replacement, were recruited. Equi-biaxial tensile testing of AsAA wall was performed on freshly sampled artic wall tissue after ascending aorta replacement. The aneurysmal aortic walls are divided into four quadrants (medial, anterior, lateral, and posterior) and indicating two directions (longitudinal and circumferential). The stiffness and elasticity were represented by the maximum Young Modulus (MYM). In our study, the focus is on the relationship between MYM and the age, as well as ascending aortic diameter (Figure 1.)

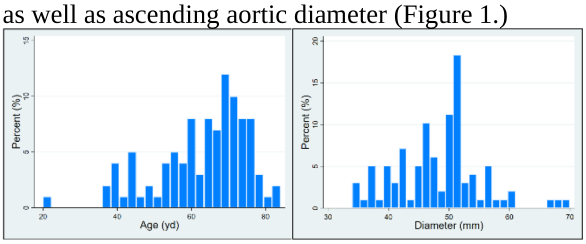

Figure 1. the distribution of the population according to the age and diameter.

Results and discussion

The mean thickness of the aneurysmal ascending aortic wall is 1.93 (± 0.41 mm). In general, when the aortic diameter increases, the aortic wall became thicker ($p < 0.05$, Figure 2.)

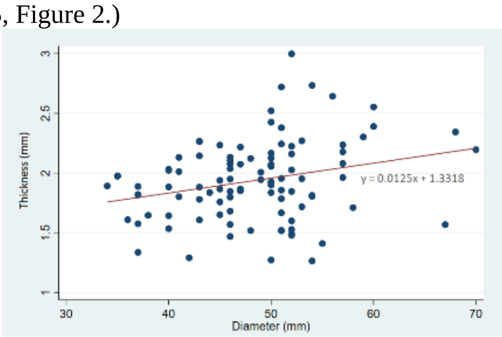

Figure 2. The distribution of aortic thickness and AsAA diameter.

In terms of MYM, the longitudinal direction was significantly higher than that in the circumferential direction. Positive correlation was statistically significant between age and MYM ($p < 0.05$), as well as aortic diameter and MYM ($p < 0.05$).

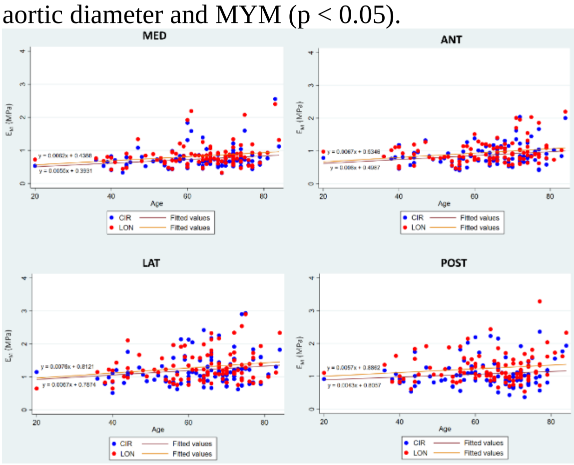

Figure 3. Impact of age based on different quadrants. EM = maximum value of Young's modulus; CIR = circumferential; LON = longitudinal; MED = medial; ANT = anterior; LAT = lateral; POST = posterior.

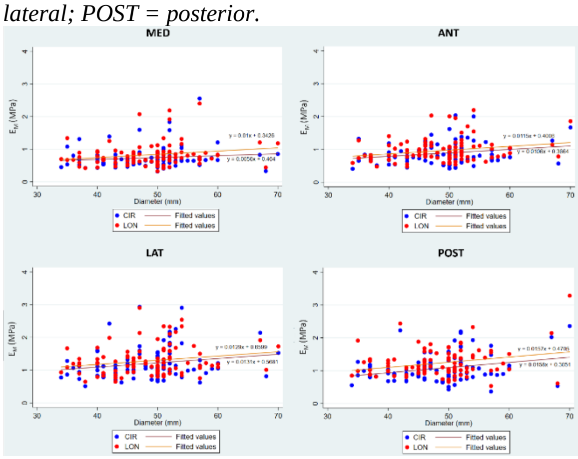

Figure 4. Impact of diameter based on different quadrants. EM = maximum value of Young's modulus; CIR = circumferential; LON = longitudinal; MED = medial; ANT = anterior; LAT = lateral; POST = posterior.

Conclusions

The ascending aortic aneurysms' pre-failure stiffness, related to the maximum value of Young Modulus, was positively correlated with the patient's age and the diameter of the ascending aorta.

Acknowledgements

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References

Erbel R, et al. 2015. Corrigendum to: 2014 ESC Guidelines on the diagnosis and treatment of aortic diseases. Eur Heart J. 36(41):2779–2779.