

EFFECTS OF UNCERTAINTIES OF IMAGE-BASED MATERIAL PROPERTIES OF GREAT VESSELS ON VASCULAR DEFORMATION

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Patient-specific computational models represent a powerful tool for the planning of cardiovascular interventions. In this context, the patient-specific material properties are considered as one of the biggest source of uncertainty [1].

In this work, we investigated the effect of the uncertainty of the elastic module (E), as computed from a recent image-based methodology [2], on a fluid-structure interaction (FSI) model of a patient-specific aorta. The Uncertainty Quantification (UQ) was carried out using the generalized Polynomial Chaos (gPC) method. Four deterministic simulations were run based on the four quadrature points [3], computed considering a deviation of $\pm 20\%$ on the estimation of the E value of the vessel wall from patient's imaging [2].

The UQ of the E parameter was evaluated on the area and flow variations among cardiac cycle extracted from five cross-sections of the aortic FSI model. Results from gPC analysis showed a not significant variation of the area and flow quantities during the whole cardiac period, thus demonstrating the effectiveness of the used image-based methodology in the inferring of the E parameter, despite its intrinsic errors due to model definition.

This study highlights the importance of imaging to retrieve useful data in an indirect and non-invasive way, to enhance the reliability of in-silico models in the clinical practice.

REFERENCES

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