

MODELLING THE ANATOMICAL VARIABILITY OF VASCULAR SYSTEMS

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MINI-SYMPOSIUM PROPOSAL

Keywords: *Blood vessels, Morphology, Anatomical atlas, Virtual geometry*

1 MINI-SYMPOSIUM PROPOSAL

The human vasculature exhibits pronounced anatomical variability. In addition to congenital and developmental factors [1, 2], lifestyle as well as aging effects [3, 4] contribute to the observed morphological and structural variation of the vasculature. It was shown that variations in flow-induced mechanical stresses can impair the protective function of the arterial intima [5, 6], thus promoting the formation and progression of a range of diseases such as atherosclerosis, aneurysms, arteriovenous malformations or moyamoya disease [6–9]. Local characteristics of arteries or the geometric configuration of bifurcations codetermine the hemodynamic stress sensed by the intima, and are therefore associated with vascular pathologies [8, 10, 11]. Likewise, topological variations in the vascular tree disrupt symmetries and the balancing of hemodynamical load, potentially stimulating formation and growth of vascular diseases [2].

This mini-symposium focuses on methodological challenges to deal with the anatomical variability in medical data and its relevance for flow-driven pathologies. Possible topics include: How to quantify and model the morphological, topological or structural variability of vascular constituents such as arteries, veins, bifurcations, vessel trees, or pathological formations such as aneurysms or stenoses? How to expand the hemodynamic characterization of a vascular structure with morphological data? How to extract information about shape from medical imaging data by means of radiomics or classical image analysis? How to approach the anatomical variability in comparative cohort studies? How to align particular observations of vascular segments with a standardized anatomical atlas? How to develop discriminative or generative models involving shape and hemodynamic parameters? The

methods presented shall serve the overall purpose of improving the model understanding of vascular systems or pathologies.

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