Effects of Blood Flow Pattern and Cross-Sectional Area on Hemodynamic of Patient-Specific Cerebral Aneurysm via Fluid-Structure Interaction Method: A Review

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Abstract:
A cerebral aneurysm is a vascular disease characterized by local ballooning of a cerebral artery. The rupture of cerebral aneurysms which is often caused by the stimulus of blood flow results in subarachnoid hemorrhage (SAH). In order to study the effects of blood flow pattern and cross-sectional area on hemodynamic, a fluid-structure interaction (FSI) simulation is carried out to investigate the blood flow analysis in different patient-specific cerebral aneurysms. Based on the current studies, hemodynamic stress which is known as wall shear stress (WSS) is the main concern in the simulation and it plays an important role in the growth and rupture of cerebral aneurysms. Different explanations regarding the growth and rupture of cerebral aneurysms have been proposed, however, there has not been a consensus in the hypothesis due to different ranges of WSS obtained with different boundary conditions through simulation. The purpose of this paper is to present a review of current explanations on the effects of blood flow pattern and crosssectional area on hemodynamic of patient-specific cerebral aneurysm via FSI. The objectives of this study are to lead future investigations about the growth and rupture of the cerebral aneurysms with qualified outcomes as well as to give a better understanding and clear visualization of WSS distribution and fluid flow pattern in the aneurysm region

Keywords: Blood Flow; Modeling Simulation; Cerebral Aneurysm; Fluid-Structure Interaction; Patient-Specific

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