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The Hemodynamic Effects of Blood Flow-Arterial Wall Interaction on Cerebral Aneurysms MARIE OSHIMA, Institute of Industrial Science, The University of Tokyo — Mechanical stresses such as wall shear induced by blood flow play an important role on cardiovascular diseases and cerebral disorders like arterioscleroses and cerebral aneurysm. In order to obtain a better understanding of mechanism of formation, growth, and rupture of cerebral aneurysm, this paper focuses on investigation of cerebral hemodynamics and its effects on aneurismal wall. The paper mainly consists of three parts. Since it is important to obtain the detailed information on the hemodynamic properties in the cerebral circulatory system, the first part discusses a large-scale hemodynamic simulation of the Cerebral Arterial Circle of Willis. The second part presents the simulation and in-vitro experiment of cerebral aneurysm with the consideration of blood flow-arterial wall interaction. Both simulations in the first and the second parts are conducted in a patient specific manner using medical images and also include modeling of boundary conditions to emulate realistic hemodynamic conditions. The present mathematical model, however, includes only macroscopic mechanical functions. Therefore, in the third part, the paper touches upon on future prospects in modeling of microscopic functions such as the effects of endothelial cells and multi physics functions such as physiological effects.

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