Image-Based CFD Modeling of Cerebral Aneurysms

Juan Cebral

Abstract Image-based computational fluid dynamics (CFD) has been increasingly used to investigate the role of hemodynamics in the mechanisms responsible for the development, progression and rupture of intracranial aneurysms. A key aspect of this approach is to be able to connect hemodynamics information to clinical data and observations and thus test hypotheses about the underlying mechanisms or to answer specific clinical questions. This requires large numbers of models in order to produce statistically significant results which in turn require efficient simulation tools and methods. Likewise, this methodology is being used to investigate the effects of different endovascular devices and procedures to improve designs and treatment plans. Again this requires further enhancements to the simulation methods to handle endovascular devices efficiently. This presentation will summarize our efforts in the development of image-based CFD methods and their application to the study of cerebral aneurysms. Particular attention will be paid to the following focus areas: (1) mechanisms of aneurysm evolution, (2) analysis of aneurysm rupture risk, and (3) effects of flow diverting devices for intracranial aneurysms.

J. Cebral (✉)
Center for Computational Fluid Dynamics, George Mason University,
Fairfax, VA 22030, USA
e-mail: jcebral@gmu.edu

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