Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

A dimensionless parameter for classifying hemodynamics in intracranial.[1] HAFEZ ASGHARZADEH, IMAN BORAZJANI, The State University of New York at Buffalo (SUNY) — Rupture of an intracranial aneurysm (IA) is a disease with high rates of mortality. Given the risk associated with the aneurysm surgery, quantifying the likelihood of aneurysm rupture is essential. There are many risk factors that could be implicated in the rupture of an aneurysm. However, the most important factors correlated to the IA rupture are hemodynamic factors such as wall shear stress (WSS) and oscillatory shear index (OSI) which are affected by the IA flows. Here, we carry out three-dimensional high resolution simulations on representative IA models with simple geometries to test a dimensionless number (first proposed by Le et al., ASME J Biomech Eng, 2010), denoted as An number, to classify the flow mode. An number is defined as the ratio of the time takes the parent artery flow transports across the IA neck to the time required for vortex ring formation. Based on the definition, the flow mode is vortex if An>1 and it is cavity if An<1. We show that the specific definition of Le et al works for sidewall but needs to be modified for bifurcation aneurysms. In addition, we show that this classification works on three-dimensional geometries reconstructed from three-dimensional rotational angiography of human subjects. Furthermore, we verify the correlation of IA flow mode and WSS/OSI on the human subject IA.

[1]This work was supported partly by the NIH grant R03EB014860, and the computational resources were partly provided by CCR at UB. We thank Prof. Hui Meng and Dr. Jianping Xiang for providing us the database of aneurysms and helpful discussions.

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Date submitted: 29 Jul 2015 Electronic form version 1.4