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Vorticity dynamics in an intracranial aneurysm TRUNG LE, IMAN BORAZJANI, FOTIS SOTIROPOULOS, University of Minnesota — Direct Numerical Simulation is carried out to investigate the vortex dynamics of physiologic pulsatile flow in an intracranial aneurysm. The numerical solver is based on the CURVIB (curvilinear grid/immersed boundary method) approach developed by Ge and Sotiropoulos, J. Comp. Physics, 225 (2007) and is applied to simulate the blood flow in a grid with 8 million grid nodes. The aneurysm geometry is extracted from MRI images from common carotid artery (CCA) of a rabbit (courtesy Dr.Kallmes, Mayo Clinic). The simulation reveals the formation of a strong vortex ring at the proximal end during accelerated flow phase. The vortical structure advances toward the aneurysm dome forming a distinct inclined circular ring that connects with the proximal wall via two long streamwise vortical structures. During the reverse flow phase, the back flow results to the formation of another ring at the distal end that advances in the opposite direction toward the proximal end and interacts with the vortical structures that were created during the accelerated phase. The basic vortex formation mechanism is similar to that observed by Webster and Longmire (1998) for pulsed flow through inclined nozzles. The similarities between the two flows will be discussed and the vorticity dynamics of an aneurysm and inclined nozzle flows will be analyzed.This work was supported in part by the University of Minnesota Supercomputing Institute.

Trung Le
University of Minnesota

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