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Vortex dynamics in ruptured and unruptured intracranial aneurysms GABRIEL TRYLESINSKI, University at Buffalo, State University of New York; ISAE-ENSICA, Toulouse, France, NICOLE VARBLE, JIANPING XIANG, HUI MENG, University at Buffalo, The State University of New York — Intracranial aneurysms (IAs) are potentially devastating pathological dilations of arterial walls that affect 2-5% of the population. In our previous CFD study of 119 IAs, we found that ruptured aneurysms were correlated with complex flow pattern and statistically predictable by low wall shear stress and high oscillatory shear index. To understand flow mechanisms that drive the pathophysiology of aneurysm wall leading to either stabilization or growth and rupture, we aim at exploring vortex dynamics of aneurysmal flow and provide insight into the correlation between the previous predictive morphological parameters and wall hemodynamic metrics. We adopt the Q-criterion definition of coherent structures (CS) and analyze the CS dynamics in aneurysmal flows for both ruptured and unruptured IA cases. For the first time, we draw relevant biological conclusions concerning aneurysm flow mechanisms and pathophysiological outcome. In pulsatile simulations, the coherent structures are analyzed in these 119 patient-specific geometries obtained using 3D angiograms. The images were reconstructed and CFD were performed. Upon conclusion of this work, better understanding of flow patterns of unstable aneurysms may lead to improved clinical outcome.

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