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Hemodynamics of cerebral aneurysms as cavity flow on a curved vessel. Effect of inertia, curvature, pulsatility and treatment with flow diverting stents FANETTE CHASSAGNE, MICHAEL C. BARBOUR, VENKAT K. CHIVUKULA, LAUREL M. MARSH, MICHAEL R. LEVITT, ALBERTO ALISEDA, University of Washington, Seattle, WA, USA — Flow in cerebral aneurysms can be described as flow in a cavity on a curved vessel, with the effects of inertia, curvature and pulsatility providing the conditions under which flow separates on the leading edge of the cavity and recirculate inside the sac against the parent vessel flow, for part or all of the cardiac cycle. This strong coherent vortex in the aneurysm can provide a quantitative metric to explain the persistence of aneurysmal flow after treatment with flow diverting stents (FDS). These high porosity meshes lower the flowrate into the sac promoting the formation of a thrombus. The aim of this study is to investigate the flow pre- and post-treatment with FDS, to understand its variation with flow conditions and aneurysm geometry. Flow inside cerebral aneurysm phantoms with varying parent vessel curvature, neck size and sac aspect ratio is measured with PIV. The hemodynamics in the sac pre- and post FDS treatment are characterized for different waveforms. The results show parent vessel curvature dominates hemodynamics and that increasing Dean number decreases the effect of the FDS treatment. This is due to a combination of changes in parent vessel hemodynamics at the aneurysm leading edge combined with the parent vessel curvature impact on stent porosity.

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