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Parametric Characterization of Flow Inside Cererbal Aneurysms Treated with Flow-Diverting Stents MICHAEL BARBOUR, Dept. of Mechanical Engineering, University of Washington, MICHAEL LEVITT, Dept. of Neurosurgery, University of Washington, CHRISTIAN GEINDREAU, Laboratoire 3SR, Universite Grenoble Alpes, LUKE JOHNSON, KESHAV CHIVUKULA, ALBERTO ALISEDA, Dept. of Mechanical Engineering, University of Washington —

Cerebral aneurysms are often treated with a flow-diverting stent (FDS) to reduce blood flow into the aneurysm sac, promoting the development of a stable thrombus. Successful treatment is highly dependent on the degree of flow reduction and the altered hemodynamics inside the aneurysm sac following treatment. Establishing a causal connection between hemodynamic metrics of FDS-treated CAs and long-term clinical outcomes requires a rigorous parametric characterization of this flow environment. We use 3D particle image velocimetry (PIV) to measure the flow inside idealized aneurysm models treated with FDS. Physiologically realistic Reynolds numbers and increasing levels of parent vessel curvature are analyzed to understand the effect of inertia on flow development. The flow velocity into the aneurysm and the topology of the flow inside the sac is shown to be highly dependent on parent vessel Dean number (De). The role of flow pulsatility is then added to the study via time-dependent waveforms. Velocity measurements at 2 values of parent vessel Womersley number (Wo) allow us to parameterize flow inside of CAs treated with FDS as a function of De, Re and Wo, improving the fundamental understanding of how FDS alter CA hemodynamics and aiding in the development of new treatments.

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