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PIV Measurement of Wall Shear Stress and Flow Structures within an Intracranial Aneurysm Model RICKY CHOW, EPH SPARROW, U. of Minn., GARY CAMPBELL, Lake Region Medical, AFSHIN DIVANI, U. of Minn., JIAN SHENG, Texas Tech Univ. — The formation and rupture of an intracranial aneurysm (IA) is a debilitating and often lethal event. Geometric features of the aneurysm bulb and upstream artery, such as bulb size, bulb shape, and curvature of the artery, are two groups of factors that define the flow and stresses within an IA. Abnormal flow stresses are related to rupture. This presentation discusses the development of a quasi-3D PIV technique and its application in various glass models at Re = 275 and 550 to experimentally assess at a preliminary level the impact of geometry and flow rate. Some conclusions are to be drawn linking geometry of the flow domain to rupture risk. The extracted results also serve as the baseline case and as a precursor to a companion presentation by the authors discussing the impact of flow diverters, a new class of medical devices. The PIV experiments were performed in a fully index-matched flow facility, allowing for unobstructed observations over complex geometry. A reconstruction and analysis method was devised to obtain 3D mean wall stress distributions and flow fields. The quasi 3D measurements were reconstructed from orthogonal planes encompassing the entire glass model, spaced 0.4mm apart. Wall shear stresses were evaluated from the near-wall flow viscous stresses.

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