Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

2D Particle Image Velocimetry and Computational Fluid Dynamics Study on Sidewall Brain aneurysm JACOB BARRERA, HAN HUNG YEH, DANA GRECOV, The University of British Columbia — Cerebral aneurysms are cerebrovascular abnormalities characterized by the weakening and dilation of a localized cerebral arterial wall. They are a prevalent vascular disorder affecting 2–5% of the worldwide population. Aneurysm rupture can be fatal. To prevent aneurysm rupture, endovascular stents can be deployed to redirect blood flow away from the aneurysm, reducing blood flow velocity in the aneurysm sac and encouraging blood vessel remodeling. Since hemodynamics plays a key role in aneurysm progression, an in vitro experimental setup was developed to mimic the cerebral circulation with particle image velocimetry (PIV) testing different internal carotid artery sidewall aneurysm models. The Newtonian and the non-Newtonian working fluids with matching density and viscosity of human blood were used. In addition, a computational fluid dynamics (CFD) analysis was conducted in parallel. Computational model was first verified and validated against PIV measurements and showed good agreements. The study showed that the Newtonian model overestimated hemodynamic parameters, such as the blood velocity and wall shear stress in the cerebral aneurysm sac, comparing to the non-Newtonian model, suggesting the shear thinning effects might be more prominent in this region.

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Date submitted: 01 Aug 2019 Electronic form version 1.4