Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Influence on the fluid mechanics of blood flow of heterogeneity and anisotropy of the coil mass deployed inside intracranial aneurysms JULIA ROMERO BHATHAL, Univ. Grenoble Alpes, CNRS, Grenoble INP, 3SR, Grenoble, France, FANETTE CHASSAGNE, LAUREL MARSH, Dpt. of Mechanical Engineering, Univ. of Washington, Seattle, WA, MIKE LEVITT, Dpt. of Neurological Surgery, Univ. of Washington, Seattle, WA, USA, CHRISTIAN GEINDREAU, Univ. Grenoble Alpes, CNRS, Grenoble INP, 3SR, Grenoble, France, ALBERTO ALISEDA, Dpt. of Mechanical Engineering, Univ. of Washington, Seattle, WA — Cerebral aneurysms are often treated with coils to induce thrombosis. Flow in coiled aneurysms has been studied extensively through CFD simulations to predict the flow after endovascular treatment. Representing coil mass as a homogeneous porous medium represents a limitation to the understanding of flow in coiled aneurysms and inhibits clinically accurate predictions. We present the characterization of the spatial heterogeneity and anisotropy of the coil mass deployed inside the aneurysmal sac based on synchrotron X-ray tomography of aneurysm phantoms treated with real coils and describe the resulting flow based on a parametrization of coil's permeability that combines a theoretical model with the experimental results. The segmented images are used to compute the mean porosity, the porosity gradient along the inertial axis of the coil, the porosity map and the corresponding permeability map for different types of spatial discretization. The results show that the porosity varies between 0.6 to 0.95, leading to a factor 100 in permeability variations. CFD simulations results compare our results with standard homogeneous isotropic modeling.

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Date submitted: 31 Jul 2019 Electronic form version 1.4