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MRI-based flow residence time in intracranial aneurysms OMID AMILI, YINGHUI LI, FILIPPO COLETTI, University of Minnesota — While the mechanisms behind development of thrombosis in cerebral aneurysms is not fully understood, there has been emerging evidence that blood flow residence time is correlated/associated with the lesion. In addition, there have been clinical observations indicating thrombus formation following aneurysm endovascular treatment perhaps due to altered hemodynamics. Therefore, a characterization of the residence time can play an important role in the development of a biomarker for the risk of rupture in untreated aneurysms and risk of thrombo-embolism in treated aneurysms. In this study, we use in vitro 4D MRI velocimetry for several aneurysms performed in a 3 Tesla magnet at submillimeter resolution to compute the flow residence time using both Lagrangian and Eulerian frameworks. As per our previous study, by integration of the volumetric velocity field, Lagrangian tracks of massless tracers are computed, followed by the residence time calculation using the presence of fluid parcels in a local and global sense. In the Eulerian approach, circulation in a plane normal to the axis of the vortex dominating the aneurysm sac is used to estimate the eddy turnover time. The former approach provides a 3D map of the residence time, while the latter estimates the order of magnitude.

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