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In Vitro Assessment of Cycle to Cycle Flow Variability in Intracranial Aneurysms using Radial 4D Flow MRI and Tomographic PIV. RAFAEL MEDERO, KATRINA RUEDINGER, DAVID RUTKOWSKI, KEVIN JOHNSON, ALEJANDO ROLDN-ALZATE, University of Wisconsin-Madison — Intracranial aneurysm rupture has been related with aneurysm geometry, and high flow activity. 4D Flow MRI has been shown to be a feasible imaging technique for assessing hemodynamics in different vascular territories. However, one of its limitations is the need to average several cardiac cycles to obtain a complete data set, causing a smoothing of the velocity profiles and errors in areas with non-laminar flow. Additionally, it requires prospective determination of the velocity encoding setting, restricting the range of velocities acquired. Furthermore, the need for reasonable scan times can lead to limits in spatial resolution, which motivates the development of improved MRI sequences such as radial acquisitions. In this study, velocities acquired with radial 4D Flow MRI where compared to tomographic PIV using a patient-specific intracranial aneurysm in-vitro model under pulsatile flow. Velocity data from multiple time points within a group of 10 cardiac cycles acquired with tomo-PIV were compared pixel-to-pixel, and averaged velocity data was compared between methods. Statistically differences were found between velocities measured with tomo-PIV at peak systole and end diastole. However, good agreement was seen when comparing 4D Flow MRI with the average time points.

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