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Improving clinical decision-making with data: defining roles for computational fluid dynamics in aneurysm management

JASON M. DAVIES[1], Dept. of Neurosurgery Dept. of Biomedical Informatics, University at Buffalo

Subjectivity plays an outsized role in the management of intracranial aneurysms (IA). Computational fluid dynamics may reduce variability and improve outcomes. In this study, we aimed to explore the utility of CFD in the management of UIAs in two domains, 1) identification of aneurysms that should be treated, and 2) prediction of occlusion outcomes for flow-diverter-treated aneurysms.

Methods: We identified aneurysm patients between September 2018 and June 2019 and computed the unruptured intracranial aneurysm treatment score (UIATS) as well as the Rupture Resemblance Score (RRS). We further identified patients treated with flow-diverters between 2011 and 2018. We computed 6 geometrical (G), 2 FD device-related (D), 4 pre-treatment (untreated, U*) and 4 post-treatment (treated, T*) hemodynamic features, which were then used in combination to train four neural network models.

Results: Treatment decisions were analyzed for 49 patients with 84 UIAs. Of the 42Conclusions: Hemodynamics contribute information relevant to the management of intracranial aneurysms. Incorporating data-driven management strategies should reduce variability in outcomes and improve patient care.

In collaboration with: Nikhil Paliwal, Dept. of Mechanical Aerospace Eng. Canon Stroke and Vascular Research Center, Univ., of Buffalo; Hui Meng, Dept. of Mechanical Aerospace Engineering, Canon Stroke and Vascular Research Center, Dept. of Biomedical Engineering, Dept. of Neurosurgery, Univ., of Buffalo.