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Coils vs stents: Lagrangian-tracking investigation of the mechanisms of healing for endovascular therapies in cerebral aneurysms[1] LAUREL MARSH, MICHAEL BARBOUR, FANETTE CHASSAGNE, VENKAT KESHAV CHIVUKULA, University of Washington, CORY KELLY, Univ of Washington Medical Center, SAM LEVY, University of Washington Medical Center, Stroke and Applied Neuroscience Center, MICHEAL LEVITT, LOUIS KIM, Univ of Washington Medical Center, ALBERTO ALISEDA, University of Washington
— We study the success of treatment in endovascularly treated cerebral aneurysms by means of Lagrangian tracking of platelets in CFD simulations of blood flow in patient-specific models. Flow-diverting stents (FDS) or coils can lead to aggregation of activated platelets and formation of a stable thrombus that fully occludes the aneurysm. However, there is currently no accurate method to predict the outcome of either endovascular therapy. We propose a series of Lagrangian metrics, based on trajectories of tracer particles introduced in the intracerebral vasculature, to understand the hemodynamics conditions that lead to stable thrombus formation as opposed to conditions that lead to incomplete embolization. We consider the two forms of therapies separately, using platelet residence time and shear history to complement Eulerian metrics that have traditionally been used to understand hemodynamics in intracranial aneurysms: Wall Shear Stress, WSS gradient, flow rate through the neck. We develop accurate predictors of outcomes for each endovascular treatment, using a large population of >50 patients to validate them. your abstract body.

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