Abstract Submitted
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Aortic emboli show surprising size dependent predilection for cerebral arteries: Results from computational fluid dynamics[1] IAN CARR, Illinois Institute of Technology, ROBERT SCHWARTZ, Minneapolis Heart Institute Foundation, SHAWN SHADDEN, Illinois Institute of Technology — Cardiac emboli can have devastating consequences if they enter the cerebral circulation, and are the most common cause of embolic stroke. Little is known about relationships of embolic origin/density/size to cerebral events; as these relationships are difficult to observe. To better understand stoke risk from cardiac and aortic emboli, we developed a computational model to track emboli from the heart to the brain. Patient-specific models of the human aorta and arteries to the brain were derived from CT angiography from 10 MHIF patients. Blood flow was modeled by the Navier-Stokes equations using pulsatile inflow at the aortic valve, and physiologic Windkessel models at the outlets. Particulate was injected at the aortic valve and tracked using modified Maxey-Riley equations with a wall collision model. Results demonstrate aortic emboli that entered the cerebral circulation through the carotid or vertebral arteries were localized to specific locations of the proximal aorta. The percentage of released particles embolic to the brain markedly increased with particle size from 0 to ≈1–1.5 mm in all patients. Larger particulate became less likely to traverse the cerebral vessels. These findings are consistent with sparse literature based on transesophageal echo measurements.

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Shawn Shadden
Illinois Institute of Technology

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