Abstract Submitted
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Flow in Porous Media as a Model for Intramural Periarterial Drainage from the Brain.[1] KETAKI JOSHI, Department of Mechanical Engineering, State University of New York at Binghamton,USA, J. DAVID SCHAFFER, Institute for Justice and Well-Being, State University of New York at Binghamton, USA, PAUL CHIAROT, PETER HUANG, Department of Mechanical Engineering, State University of New York at Binghamton, USA — Accumulation of beta-amyloid proteins in the vasculature of the brain is a characteristic of Alzheimer's disease. One of the pathways to clear these proteins out of the brain is through intramural periarterial drainage (IPAD) along artery walls. There is evidence that the direction of this flow is opposite to that of the arterial blood flow. The periarterial space where IPAD takes place is mostly made up of smooth muscle cells and extracellular matrix. Deformation of the arterial wall boundaries are theorized to drive IPAD. In our earlier work, we reported on a hydrodynamic mechanism for reverse flow through the artery wall that was driven by forward propagating and reflected waves along the boundaries of an open conduit. In our current work, we have expanded our model by incorporating porous media inside the flow channel. We analyzed images of artery deformations in the brains of anesthetized mice provided by Cornell University (N. Nishimura). The quantified boundary deformations of the cerebral arteries are used in numerical simulations to predict the magnitude of the induced IPAD through the porous periarterial space. The role of geometry (i.e. porosity) and permeability on the fluid transport is determined.

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