Abstract Submitted
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Computational Study of Non-Physiological Hemodynamics in the Cephalic Arch[1] KEVIN CASSEL, MICHAEL BOGHOSIAN, S.M. JAVID MAHMOUDZADEH, Illinois Institute of Technology, MARY HAMMES, University of Chicago Medical Center — Numerical simulations of the unsteady, two-dimensional, incompressible Navier-Stokes equations are performed for the flow in a two-dimensional geometry created from radiological images and Doppler flow measurements of the cephalic arch in dialysis patients with a brachiocephalic fistula (surgically placed direct arterial-venous connection). The simulations are performed before insertion of the fistula and at subsequent time intervals as the cephalic vein arterializes over a period of three to six months. A mature fistula, with increased diameter and flow rate, can exhibit Reynolds numbers that are more than one order of magnitude larger than that of the pre-fistula vein. We evaluate the effect of this increased (physiologically abnormal) Reynolds number on flow structures and wall shear stresses through the curved cephalic arch, which is a site prone to stenosis in fistula patients. The long-term goal is to investigate if the development of initimal hyperplasia and stenoses correlates with wall shear stresses or other hemodynamic variables obtained using computational hemodynamics.

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