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Assessing Hemodynamics in the Ascending Aorta due to Surgical Anastomosis and Flow Modulation of Left Ventricular Assist Device. AKSHITA SAHNI, ANDREW BEITER, University of Colorado, Boulder, JAY PAL, University of Colorado, Anschutz Medical Campus, DEBANJAN MUKHERJEE, University of Colorado, Boulder — A Left Ventricular Assist Device (LVAD) is a surgically implantable blood pump that supports the circulatory function of the left ventricle. LVADs are widely used as bridge-to-transplant as well as destination therapy for advanced heart failure patients. However, LVAD therapy is commonly associated with complications such as pump thrombosis, ischemic stroke, and gastrointestinal bleeding. These complications are intimately related to the altered state of hemodynamics induced by LVAD pump flow and outflow cannula anastomosis. Our objective in this study is to quantify the flow features in the vicinity of the anastomosis by systematic variation of LVAD cannula angle and pump flow pulsatile modulation using 3D computational hemodynamics simulations. We use patient computed tomography images to create an aorta model and virtually implant an LVAD outflow cannula in 9 different orientations. A constant flow, and low and high levels of pulsatile flow modulation are considered for each model. We identify variations in flow velocity, normalized helicity and wall shear stress patterns as a function of mentioned key parameters and compare our observations to flow in normal aorta without LVAD support. Insights from these observations can enable improved LVAD therapy decision making.

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