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Optimization of the Outflow Graft Position and Angle in a Left Ventricular Assist Device PATRICK MCGAH, Univ of Washington, ANTHONY PRISCO, Medical College of Wisconsin, JENNIFER BECKMAN, NAHUSH MOKADAM, CLAUDIUS MAHR, ALBERTO ALISEDA, Univ of Washington — The placement of the outflow graft in the aorta plays a key role in the hemodynamics of Left Ventricle Assist Devices (LVAD), a medical device with a growing importance in the treatment of end-stage heart failure. We use a patient-specific computational model of the VAD and the ascending aorta to investigate the impact of VAD outflow graft configuration on the residence time and wall shear stresses along the ascending aorta and the ostia of the upper branches. The flow induced by the combination of VAD output through the graft anastomosed to the aorta and the limited cardiac output through intermittent opening of the aortic valve is studied to determine the nature of thrombogenic flow patterns. Outflow grafts are virtually anastomosed along the ascending aorta or subclavian artery of the patient-specific model at different positions and angles that are surgically-informed. Detailed markers of thrombosis, such as cell residence time, wall shear stress, and shear stress gradients are analyzed and compared for the different configurations. The angle of incidence of the outflow graft critically influences the volume of recirculating flow between aortic valve and anastomosis, and the aortic pressure acting against aortic valve opening.

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