Investigation of the Left Ventricular Flow Dynamics in the Presence of Severe Mitral Annular Calcification

BATOU EL - SAYEGH, LYES KADEM, GIUSEPPE DI LABBIO, Concordia Univ, GREGG S. PRESSMAN, ED-INRIN OBASARE, Albert Einstein Medical Center — Valvular calcification is frequent with aging and diverse diseases. Mitral annular calcification (MAC) is a degenerative process where the fibrous annulus of the mitral valve degrades. MAC can be found in approximately 40% of people aged over 65. It is associated with increased occurrence of cardiovascular diseases including stroke. This experimental work is aimed to investigate the effects of MAC on the left ventricle (LV) hemodynamics and to develop new clinical parameters. Two patient-specific 3D-printed mitral valves with moderate and severe MACs were placed in a left heart simulator. The velocity fields in the LV were acquired using time-resolved particle image velocimetry (TR-PIV) and compared to normal LV flow. The velocity fields were used to evaluate the temporal evolution of the vorticity fields and viscous energy loss in the LV. The presence of MAC disturbed the flow in the LV leading to markedly increased viscous energy losses. As the severity of MAC increased, the velocity of the inflow jet also increased causing significant perturbations to the normally-occurring vortex in the LV.

Batoul El - Sayegh
Concordia Univ

Date submitted: 28 Sep 2016

Electronic form version 1.4