3D Characterization of Transmitral Vortex using Defocusing Digital Particle Image Velocimetry

AHMAD FALAHAHTPISHEH, BRANDON DUEITT, University of California Irvine, NIEMA PAHLEVAN, California Institute of Technology, ARASH KHERADVAR, University of California Irvine — In this study, we have experimentally characterized the 3D vortex passing through a physiologically relevant model of mitral valve using Defocusing Digital PIV (DDPIV). The valve model was made of soft silicone with diameter of 25 mm, similar to the adult mitral valve. The mitral model possesses a large anterior and a small posterior leaflet that results in asymmetric formation of transmitral vortex. A piston-cylinder mechanism drives the flow and travels to produce a range of $L/D$ from 2 to 6. We have characterized the shape of the 3D vortex forming through the D-shaped orifice of a mitral valve using DDPIV technique. The evolution of the vortex has been illustrated for different stroke ratios.

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