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Fluid structure interaction (FSI) simulation of a bileaflet mechanical heart valve (MHV) LIANG GE, IMAN BOR, University of Minnesota, LAKSHMI DASI, Georgia Institute of Technology, FOTIS SOTIROPOULOS, University of Minnesota, AJIT YOGANATHAN, Georgia Insitute of Technology — MHVs are widely used as prosthetics for dysfunctional heart valves. All current MHV designs, however, are prone to thrombus formation, which is believed to be strongly associated with the non-physiological hemodynamics patterns and elevated shear stress level induced by the valve; it is, therefore, of enormous practical importance to study the hemodynamics through MHVs. Here we present an FSI solver modeling the physiological MHV hemodynamics. The solver uses a strong coupling scheme for the FSI problem and a recently developed curvilinear grid/immersed boundary method for flow simulation. The FSI solver is applied to model an in-vitro MHV hemodynamics measurement. The experimental pulsatile flow waveform with peak Reynolds number of 4000 is specified at the inlet and the flow is modeled by DNS. The results, including the dynamics of wake vortical structure, shear distribution and leaflet kinematics, are validated against the experimental data.

Liang Ge
University of Minnesota

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