Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Implantation orientation effects of a bileaflet mechanical heart valve in an anatomic left ventricle-aorta configuration[1] HOSSEIN ASADI, MOHAMMADALI HEDAYAT, IMAN BORAZJANI, Texas A&M University — Three-dimensional high-resolution simulations of a bileaflet mechanical heart valve (BMHV) have been carried out for an anatomic left ventricle-aorta configuration. The geometry of the anatomic left ventricle (LV) is reconstructed from MRI scanned images of a healthy subject and its motion is prescribed based on a lumped parameter model. The highly validated multi-block sharp interface curvilinear immersed boundary method (CURVIB) fluid-structure interaction (FSI) solver is used in which anatomic aorta and LV are discretized with a boundary-conforming and non-conforming curvilinear meshes, respectively. The motion of BMHV is calculated using the strong coupled FSI accelerated with Aitken convergence technique. The simulations are performed for three valve orientations, differing 45 deg from each other for two cardiac cycles. The kinematics of heart valves and instantaneous hemodynamics of each case, as well as, shear stress and platelet activation are analyzed to investigate the performance of each orientation.

[1]This work was partially supported by National Science Foundation award CBET 1453982 and the American Heart Association Grant 13SDG17220022. The computational resources were provided by the High-Performance Research Computing (HPRC) center at Texas A&M University.

Hossein Asadi
Texas A&M University

Date submitted: 30 Jul 2019 Electronic form version 1.4