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Numerical study of the influence of the hinge gap width on the hinge flow fields of bileaflet mechanical heart valves HELENE SIMON, Georgia Tech, LIANG GE, University of California SF, FOTIS SOTIROPOULOS, University of Minnesota, AJIT YOGANATHAN, Georgia Tech — Previous clinical and in-vitro studies have shown that the complex non-physiologic hemodynamics occurring in the hinge region of bileaflet mechanical heart valves promotes blood cell damage and thrombus formation. Modifying the hinge design could improve the flow and thus reduce the associated blood cell trauma. This study aims at investigating numerically the effect of the hinge gap width on the flow field. The governing equations are solved using a Cartesian sharp interface immersed boundary method coupled with a hybrid staggered/non staggered control volume approach. The hinge dimensions are obtained from MicroComputed Tomography of a clinical valve. The leaflet motion and inlet velocity profile are imposed based on the Fluid-Structure Interaction simulations of the bulk flow of a valve placed under aortic physiologic conditions. 3D pulsatile flows through two hinge designs are presented along with their Lagrangian analysis. The hinge gap width is shown to have a strong influence on the flow, and thus on blood cell trauma.

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