Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Comparison of platelet activation through hinge vs bulk flow in mechanical heart valves[1] MOHAMMADALI HEDAYAT, IMAN BORAZJANI, State University of New York at Buffalo — Bileaflet mechanical heart valves increase the risk of thrombus formation in patients which is believed to be initiated by platelet activation. Platelets can be activated by the elevated shear stresses in the bulk flow during the systole phase or the flow through the hinge during the diastole. However, the importance of platelet activation by the bulk flow vs the hinge in MHVs has yet to be studied. Here, we investigate the contribution of each of the above mechanisms to the activation of platelets in MHs by performing simulation of the flow through a 25mm St. Jude Medical valve placed in a straight aorta. Two different gap sizes (250 and 150 micrometer) are used in this study. The simulations are done using a sharp interface curvilinear immersed boundary method along with a strong-coupling algorithm for FSI solver on overset grids. The platelet activation through the hinge for different gap sizes is compared to the activation in the bulk flow using two platelet activation models to ensure the consistency of the results. Our results for all gap sizes using different activation models show that the integration of platelet activation caused by the bulk flow is several times higher in comparison to the activation through the hinge.

[1]This work is supported by the American Heart Association grant 13SDG17220022, and the computational resources were partly provided by Center for Computational Research (CCR) at University at Buffalo.

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Date submitted: 31 Jul 2017 Electronic form version 1.4