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Platelet activation through a Bi-leaflet mechanical heart valve[1]
MOHAMMADALI HEDAYAT, IMAN BORAZJANI, The State University of New York at Buffalo — Platelet activation is one of the major drawbacks of the Mechanical Heart Valves (MHVs) which can increase the risk of thrombus formation in patients. The platelet activation in MHVs can be due to the abnormal shear stress during the systole, the backward leakage flow during the diastole, and the flow through the hinge region. We investigate the contribution of each of the above mechanism to the activation of platelets in MHVs by performing simulations of the flow through the MHV and in the hinge region. The large scale heart valve simulations are performed in a straight aorta using a sharp interface curvilinear immersed boundary method along with a strong-coupling algorithm under physiological flow conditions. In addition, in order to perform the simulation of hinge region the flow field boundary conditions are obtained from the largescale simulations during a whole cardiac cycle. In order to investigate the role of hinge flow on platelet activation in MHVs, a 23mm St. Jude Medical Regent valve hinge with three different gap sizes is tested along with different platelet activation models to ensure the consistency of our results with different activation models. We compare the platelet activation of the hinge region against the bulk of the flow during one cardiac cycle.

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