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Mesoscopic Modeling of Thrombus Formation and Growth: Platelet Deposition in Complex Geometries ALIREZA YAZDANI, GEORGE KARNIADAKIS, Brown University — Haemodynamics and blood rheology are important contributing factors to thrombus formation at a vulnerable vessel wall, and adhesion of platelets to a vascular surface, particularly in regions of flow stagnation, recirculation and reattachment is significantly important in formation of thrombi. For example, haemodynamic micro-environment can have effects on thrombosis inside the atherosclerotic plaques and aneurysms. To study these effects, we have developed and validated a model for platelet aggregation in blood flow using Dissipative Particle Dynamics (DPD) method. In this model platelets are considered as single DPD particles interacting with each other via Morse potential once activated. We assign an activation delay time to each platelet such that they remain passive during that time. We investigate the effect of different geometries on platelet aggregation by considering arterial stenosis at different levels of occlusion, and aneurysms of different shapes and sizes. The results show a marked increase in platelet aggregation within the boundaries of deceleration zone by increasing the degree of stenosis. Further, we observe enhanced platelet margination and wall deposition in the presence of red blood cells.

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