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Platelets aggregation in pathological conditions: role of local shear rates and platelet activation delay time. HE LI, ALIREZA ZARIF KHALILI YAZDANI, GEORGE KARNIADAKIS, Brown Univ — Platelets play an essential role in the initiation and formation of a thrombus, however their detailed motion in blood vessels with complex geometries, such as in the aneurysmal vessel or stenotic vessel in atherosclerosis, has not been studied systematically. Here, we perform spectral element simulations (NEKTAR code) to obtain the 3D flow field in blood vessel with cavities, and we apply the force coupling method (FCM) to simulate the motion of platelets in blood flow. Specifically, simulations of platelets are performed in a 0.25 mm diameter circular blood vessel with 1 mm length. Corresponding coarse-grained molecular dynamics simulations are employed to provide input to the NEKTAR-FCM code. Simulations are conducted at several different Reynolds numbers (Re). An ellipsoid-shaped cavity is selected to intersect with the middle part of the circular vessel to represent the aneurysmal part of the blood vessel. Based on the simulation results, we quantify how the platelets motion and aggregation in the blood vessel cavities depend on Re, platelet activation delay time, and the geometry of the cavities.

Alireza Zarif Khalili Yazdani
Brown Univ

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