Title: Simulation of platelet, thrombus and erythrocyte hydrodynamic interactions in a 3D arteriole with in vivo comparison

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Cylindrical blood vessels, ellipsoid platelets and biconcave-shaped deformable erythrocytes (RBCs) are important participants in hemostasis and thrombosis. However, due to the challenge of including these components in simulation tools, few simulation studies have included all of them in realistic three-dimensional models. In the present study, we apply a recently developed simulation model to incorporate these components and analyze the flow in a thrombotic tubular arteriole, particularly the detailed hydrodynamic interactions between the thrombus shape, RBCs and platelets. It was found that at certain azimuth positions, the velocity drops in the proximity of both the upstream and downstream edge of the thrombus, which is accompanied by a rapid velocity increase in the narrowed region. The RBCs alter the flow profiles significantly from the typical low Reynolds (Re) number flow, and also enhance the deposition of free flowing platelets onto the thrombus. By evaluating the platelet-thrombus interaction and platelet-RBC interaction together, several mechanisms of platelet deposition augmentation are identified. With in vivo data comparison, our model illustrates the potential of future thrombosis studies that incorporate detailed receptor-ligand adhesion modules.