BLOOD FLOW SIMULATION USING SMOOTHED PARTICLE HYDRODYNAMICS

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**Abstract**

Blood flow rheology is considered to be a complex phenomenon. In order to understand the characteristics of blood flow, it is important to identify key parameters those influence the flow behaviour of blood. Further, the characterisation of blood flow will also enable us to understand flow parameters associated with physiological conditions such as atherosclerosis. Thrombosis plays a crucial role in atherosclerosis, or to stop bleeding when a blood vessel is injured. This article focuses on using meshless particle-based Lagrangian numerical technique named smoothed particles hydrodynamic (SPH) method to study the flow behaviour of blood and to explore flow condition that induces formation of thrombus in a blood vessel. Due its simplicity and effectiveness, the SPH method is employed here to simulate the process of thrombogenesis under the influence of various blood flow parameters. In the present SPH simulation, blood is modelled by particles that have characteristics of plasma and of platelets. To simulate coagulation of platelets which forms thrombus, the adhesion and aggregation process of platelets are modelled by an effective inter-particle force model. With these models, platelet motion in the flowing blood and platelet adhesion and aggregation are effectively coupled with viscous blood flow. In this study, the adhesion and aggregation of blood particles are performed on a bifurcated artery under a various low Reynolds number scenarios. The results are compared with experimental results and a good agreement is found between the simulated and experimental results.