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Analysis of the coagulation kinetics under prosthetic heart valve flows[1] SYED SAMAR ABBAS, BYRON A. ZAMBRANO, IMAN BORAZJANI, J. Mike Walker '66 Department of Mechanical Engineering, Texas AM University — Thrombosis is a complex process characterized by a cascade of biochemical reactions during which the zymogens convert into active enzymes, promoting the formation of a blood clot. The two coagulation pathways, extrinsic and intrinsic, activating through the Tissue factor (TF) and the activation of the Hageman factor (FXII), respectively, trigger this chain of reactions. The two pathways converge into a common pathway with the activation of factor X (FX), which leads to the activation of thrombin and the conversion of fibrinogen into fibrin. The fact that the dynamics of coagulation could be affected by the flow conditions, renders the phenomenon difficult to be studied *in-vivo*. In this study, the physics of blood clotting under aortic flow field generated by prosthetic heart valves has been numerically analyzed. The Hockin-Mann based Platelet-plasma model has been employed to investigate the dynamics of the biochemical species while a sharp interface Curvilinear Immersed Boundary Method (CURVIB) has been used to evaluate the cardiac mechanics and hemodynamics of prosthetic heart valves. The numerical results provide insights into the concentration of species which are too low to be detected and have been validated against published data.

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