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Invariant manifolds and blood flow. Preliminary report.

Numerous biological and clinically-relevant processes are regulated by the topological transport structure of blood flow. This is especially the case in large vessels where flow is often transiently turbulent. Precise characterization of flow conditions in such domains is widely-important yet very challenging. Significant progress has been made recently by combining imaged-based modeling techniques with computational dynamical systems methods, which we will discuss in this talk. More recently, we have been investigating the relationship between invariant manifolds and their potential biomechanical influence towards blood clotting. Specifically, platelet activation (a precursor for clotting) is strongly influenced by shear stress. Since most platelets are contained in the flow domain, it is important to consider stresses acting on platelets as they are advected. We will discuss recent work investigating the relationships between cumulative stress and invariant manifolds. (Received September 14, 2010)