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Quantification of the Hemodynamic Environment around Large Arterial Blood Clots CHAYUT TEERARATKUL, DEBANJAN MUKHERJEE, University of Colorado Boulder — Pathological blood clotting (thrombosis) is a primary cause or complication in stroke and other cardiovascular diseases. Blood flow and transport in the thrombus neighborhood are intimately connected to disease progression and treatment efficacy. Coherent flow structures around a thrombus governs the transport of coagulation proteins and thrombolytic drug. Forces along thrombus boundary can influence clot growth, and drive permeation of biochemical species. The objective of this work is to characterize the complex hemodynamic environment around an arterial thrombus of heterogeneous microcomposition. Specifically in our study, this objective involved understanding the role of key parameters like thrombus shape, microstructure, and wall disease state on local flow phenomena. We use a hybrid particle-continuum based finite element framework to model pulsatile flow in two-dimensional and three-dimensional arterial thrombus configurations. Flow-mediated transport is further characterized using Lagrangian analysis of coherent flow structures and transport patterns. Using parametric simulations, we illustrate the influence of varying clot geometry, clot microstructure, and extent of wall disease states on flow and transport processes in arterial thrombus neighborhood.

Chayut Teeraratkul
University of Colorado Boulder

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