Title: modeling thrombus formation in vivo.

Abstract:

The formation of a stable thrombus in vivo is a complex sequence of events that involves platelet engagement with the disrupted endothelial matrix, activation, secretion and contact depending signaling to name a few. Intravital confocal microscopy provides us with a glimpse of the real time succession and interaction of many of the events that lead the formation of a stable thrombus. Here we use mathematical modeling to simulate such events. The goal is to reproduce the formation of a stable thrombus as observed *in vivo* with particular attention to the size and the qualitative architecture of the thrombus. The information obtained from the real time confocal fluorescence images acts as a guide. We focused our attention to thrombi formed in the mouse cremaster muscle arterioles. We modeled blood flow and platelet deposition using a combination of Lattice Boltzmann and advection-diffusion equations to describe transport phenomena outside and inside the thrombus. Each platelet was modeled as an object governed by a set of rules that determine the probabilities of attachment, detachment, irreversible attachment and granule release. Our goal is to develop a comprehensive mathematical framework which will enable us to theoretically predict size and architecture of thrombi in wild type, different mutant mice, and investigate how the spatio-temporal activation profile of platelets shapes thrombus formation. We believe this is important in order to generate testable predictions, a hallmark of sound theoretical models, and to gain insight into which factors are primary contributors in the proper assembly of a thrombus.

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