A numerical model to study hemodynamics arising from malaria infection

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Summary

Malaria is one of the most serious infectious diseases on earth. We have about five hundred million patients with two million deaths. When a malaria parasite invades and matures inside a red blood cell (RBC), the infected RBC (IRBC) becomes stiffer and cytoadherent. We propose a numerical model of hemodynamics arising from malaria infection. Our model is based on a Lagrangian and free mesh method (particle) method. A spring network model is employed to compute elastic force generated by the deformation of IRBC membrane. Adhesive property of IRBCs to surrounding cells is also expressed by using a local spring model. This model provides us stable computations even for the complex interactions of RBCs in flowing blood. We present several numerical results, including effects of adhesive interactions on the microcirculation.