NUMERICAL RESEARCH OF MICROCIRCULATORY THROMBOSIS REGIMES IN CORONARY VASCULAR NETWORKS

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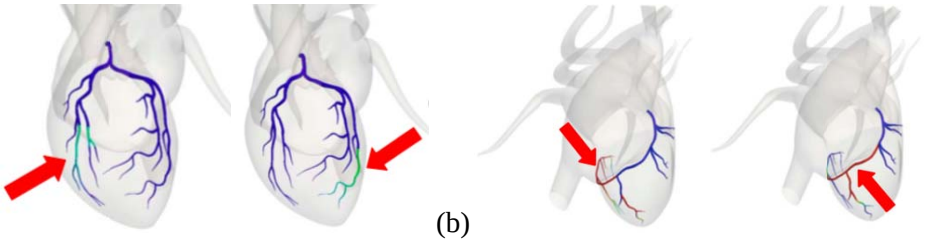
The work is devoted to mathematical modeling of blood coagulation in vascular networks. Clots formation in the bloodstream lead to a change in blood flow redistribution. Thrombosis in one branch may alter the flow distribution in the adjacent branches of the vascular bed. The blood flow affects the localization and structure of new clots.

Flow redistribution in vascular networks as a result of infiltration with microthrombi and clotting factors was investigated. Each vessel of the network was divided into segments in which biochemical blood clotting reactions and their convective transfer occur. As a result of coagulation reactions in the network, fibrin-polymer clots are formed and hamper blood flow.

Both networks with varying degrees of asymmetry and anthropomorphic vascular networks were considered. In order to simulate capillary networks different scaling closures between arteries and veins were considered.



(a) (b)

Using the example of the coronary network, it is shown that different value of thrombin concentration leads to thrombus formation in different branches. (a) - two regimes in the left coronary artery (b) - two regimes in the right coronary artery.

In the future, the model will open the possibility of a personalized thrombogenic risk assessment.

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Literature.

1) *GuriaG.Th., Herrero M.A., Zlobina K.E.* A mathematical model of blood coagulation induced by activation sources // Discrete and Continuous Dynamical Systems. Series A. – 2009. – V. 25. No.1. – p. 175-194.