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COMPUTATIONAL ANALYSIS OF THE CORONARY CIRCULATION DURING VENTRICULAR PACING

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Ventricular pacing is used for the treatment of the disorders of the conduction system of the heart. There are different algorithms of the paced rhythms. Nevertheless, none of them can substitute healthy heart function. Thus, the adverse haemodynamics is associated with a technically normal pacing system [1]. The main reasons are the asynchronous ventricular activation or improper placement of the pacemaker. Locally different myocardium contraction results in deficiencies in perfusion and glucose uptake. These disorders may lead to a decrease of cardiac output and development of cardiac insufficiency [2]. The study of coronary circulation under these conditions allows to predict complications and to optimise pacemaker settings. In this work, we use previously developed the 1D model of the coronary circulation [3]. We perform the simulation of the coronary flow during different ventricular pacing. We analysed coronary flow in the right (RCA) and left (LCA) coronary arteries during asynchronous contraction of the left (LV) and right (RV) ventricular. The myocardium stress increases with the distance from the stimulated region. We simulate this conditions by applying non-uniform stress coefficient to the external pressure, which acts on the coronary vessels. In both cases, we consider different localisation: RV apex, RV base and LV. Basing on our numerical simulations, we conclude, that both RV and LV stimulation has no impact on the flow in RCA. Both RV and LV stimulation cause increase in the blood flow in LCA. Stimulation of the RV apex and RV base provide more increase of the flow in LCA relative to the LV stimulation.

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