

1 Mathematical modeling of vortex processes in the left ventricle and aorta

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A detailed analysis of the approaches to the description of swirling fluid flows in the left ventricle of the heart (LV) is performed. The formulation of the problem of the study of vortex processes in the LV with mobile walls of the LV is formulated as a system of differential equations in a moving system of ellipsoidal coordinates with respect to the flow velocity, vorticity and movement of the LV wall. For the solution of the problem in the form of a system of nonlinear differential equations in partial derivatives, an iterative numerical-analytic method based on the use of integral transformations on spatial variables and time is proposed. The obtained simulation results indicated the presence of vortex rings at the entrance to the aorta and their distribution on the aorta during fluid movement