Biomechanics. Experimental and mathematical models

The ‘length-tension’ loop in isolated myocardial preparations of the right ventricle of normal and hypertrophied hearts of male rats

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To assess the influence of geometrical factors on cardiac contractility indexes of whole heart the mechanical activity of isolated thin trabeculae of the right ventricle of rats with and without myocardial hypertrophy contracting under physiological load conditions were investigated. Such contractions reproduce the succession of isometric and isotonic load in a single twitch, similar to the changes in pressure and in volume of the heart cavity during cardiac cycle. After monocrotaline injection of 2 month old rats, hypertrophy of the right ventricle was developed. For the first time shown, that the loop area ‘stress-strain’ in the hypertrophied myocardium revealed the increase compared with that in the myocardium of rats in the control group under the same afterload values. The angle of slope of end-systolic elastans ‘stress-strain’ decreased in the hypertrophied myocardium compared with control group rat myocardium. Results correlate with the change in the ‘pressure-volume’ loop.

Automatic control model of the three-tier arm type manipulator in the aimed-movement task

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In this work we consider the problem of constructing automatic control models of three-tier limb-type manipulator repeating flat goal directed human movement. Moreover, we assume that the geometrical limitations of the human hand were imposed on the manipulator. We consider the elbow and shoulder angles as parameters of the position. Wrist angle is fixed. The space of end angular positions was obtained analytically with respect of hand parameters and geometric restrictions. We constructed automatic control and estimated its performance. We recorded the natural motion of human hand and compared results with results of automatic control. As a result we derived the mathematical model of control of three-tier manipulator that is similar to manipulation model of real limb motion. The investigation supported by RSF grant 14-50-00029.