

Quantitative Modelling of Cardiovascular Physiology

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Abstract

The short term regulation of cardiovascular function is accomplished by the autonomic nervous system reflexes. This physiologic function has been described in terms of arterial blood pressure and heart rate control.

We developed a computational software to analyze left ventricle pressure and volume measurements simultaneously, which enables the extraction of left ventricle and arterial physiologic assessment, including mechanical energies and efficiency. This analytical tool was used to analyse instantaneous and dynamic hemodynamic changes in vivo in rabbits during acute cardiovascular perturbations produced by the stimulation of autonomic reflexes, for instance arterial baroreflex, carotid chemoreflex and cardiac chemoreflex.

This analysis revealed the impact of autonomic regulation on cardiovascular energetics and efficiency.

Keywords: Cardiovascular reflexes, Ventriculo-arterial coupling, Cardiac efficiency.