

Efficiency Evaluation of Autonomic Heart Control by Using the Principal Component Analysis of ECG P-Wave

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Summary

Background

Cardiac output is controlled by the autonomic nervous system by changing the heart rate and/or the contractions of the heart muscle in response to the hemodynamic needs of the whole body. Malfunction of these mechanisms causes the postural orthostatic tachycardia syndrome and/or the chronic fatigue syndrome. Evaluation of functionality and efficiency of the control mechanisms could give valuable diagnostic information in the early stages of dysfunction of the heart control systems and help to monitor the healing process in rehabilitation period after interventions.

Objectives

In this study we demonstrate how P-wave changes evoked by an orthostatic test could be quantitatively evaluated by using the method based on the principal component analysis.

Methods

ECG signals were recorded during an orthostatic test performed according to the typical protocol in three groups of volunteer subjects representing healthy young and older persons, part of which had transient periods of supraventricular arrhythmias. Quantitative evaluation of P-wave morphology changes was performed by means of principal component analysis-based method.

Results

Principal component-based estimates showed certain variety of P-wave shape during orthostatic test, what revealed a possibility to evaluate the properties of parasympathetic heart control.

Conclusions

Quantitative evaluation of ECG P-wave changes evoked by an orthostatic test by

using a newly developed method provides a quantitative estimate for functionality and efficiency of the heart rate control mechanisms. The method could be used in eHealth systems.

Keywords

principal component analysis, autonomic heart control, ECG P-wave

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