The Estimation of Arterial Stiffness Based on Analysis of Heart Rate

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The estimation of arterial stiffness based on analysis of heart rate.

Hemodynamics model of human cardiovascular system has been proposed. This model allowed us to establish the relationship between index of arterial stiff-ness and pulse rate variability. We concluded that increased arterial stiffness leads to a decrease in total spectral power of pulse beat-to-beat intervals. It can be used for diagnostic evaluation. A new approach for estimation arterial stiffness by assessing the relative spectral power of pulse rate variability and heart rate variability (beat-to-beat R-R intervals) was suggested. A group of volunteers, consisting of 25 healthy people aged from 20 to 65 years were examined. ECG signal was recorded in the first standard lead. The sig-nal of peripheral arterial pulse was obtained by finger photoplethysmograph probe. The difference in magnitude of total spectral power of pulse rate variability and total spectral power of heart rate variability decrease with increasing age of subjects, which corresponds to the model evaluation and can be explained by age-related changes in arterial stiffness. Relative differences between power spectral density of pulse rate variability and heart rate variability among the older age group is shifted to lower frequencies, which may be caused by changes in temporal parameters in the secretion of vasoactive substances. Diagnostic index for estimation arterial stiffness was obtained by determin-ing relative differences in the spectral characteristics of pulse rate variability and heart rate variability. Comparative estimation between the proposed diagnostic index and arterial stiffness index, which defined by contour analysis of digital volume pulse, were presented; correlation coefficient was 0,92; $p < 0.02$.