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The significance of artificial neural networks and biosignal processing in understanding of pathogenesis of syncope

Introduction & Aim: The predictive power of used statistical models is limited, so the alternative modes have been arisen, like Artificial Neural Networks (ANN). Artificial neural networks are an excellent candidate for a classifier with multiple input parameters. The aim of the study is use of ANN structure for modeling complex causal relationship between the selected predictive variables obtained on the basis of standard cardiologic examination and diagnosis of syncope.

Method: Data were obtained using short ECG analysis (Shiller AT-10), non-invasive beat-to-beat heart rate variability and baroreflex sensitivity (Task Force monitor) and 24 hour ambulatory ECG monitoring with long term HRV analysis. ECG parameters were obtained from the signals of all 12 ECG channels over the past 5 minutes using commercial software (Schiller AT-10, Austria). Total number of predictive variables is 53, from the categories of ECG time domain and spectral domain variables and parameters. The state of a sample of 496 adult patients was characterized by predefined set of 53 variables, diagnosed in accordance with the following distribution control (negative) group comprising 131 individuals while positive group includes 365 patients who experienced syncope. The available set of patients was divided into two groups training group of 284 patients, of which 50 in the control group, and test group of 262 patients, of which 131 represent complete control group.

Results: The results of this procedure are shown in Figures (1, 2), which present the relationship of the most important predictor variables and the state of patient groups. The onset of syncope is in direct correlation with higher value of LF ms, heart rate, QTc, lower value of QT interval, pNN50%, SDNN, higher positive value of P axis.

Conclusion: In this particular case the ANN structure enabled us a highly reliable discrimination of patients with syncope and patients without risk, based on standard cardiologic examination procedure.

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Biography

Branislav Milovanic Professor of Internal medicine and Cardiology, Medical faculty, University in Belgrade, Serbia. He has his expertise in cardiology, internal medicine and evaluation of autonomic nervous system.

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