

Multivariate Classification of Brugada Syndrome Patients Based on the Autonomic Response during Sleep, Exercise and Head-up Tilt Testing

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Aim: Risk stratification for patients suffering from Brugada syndrome (BS) remains a challenging problem. Since the autonomic function has been reported to provide relevant information for BS prognosis, several autonomic markers were estimated overnight and during exercise and head-up tilt (HUT) testing for 44 BS patients, in order to design classifiers capable of distinguishing patients at different levels of risk.

Methods: The classification performance of predictive models built from the optimization of a step-based machine-learning method based on heart rate variability (HRV) markers were compared, so as to identify those autonomic protocols and markers best distinguishing between symptomatic and asymptomatic patients.

Results: Although exercise and HUT testing together led to better predictive results than when they were separately assessed ($AUC_{\text{exercise+HUT}}=0.91 \pm 0.04$; $AUC_{\text{exercise}}=0.89 \pm 0.03$; $AUC_{\text{HUT}}=0.88 \pm 0.06$), among all analyzed combinations, the night-based classifier presented the best performance ($AUC_{\text{night}}=0.95 \pm 0.03$), using the least amount of features. Moreover, the optimal features subset was mostly composed of markers extracted between 4 a.m. - 5 a.m.

Conclusion: Results provide further evidence for the role of nighttime analysis, mainly during the last hours of sleep, for risk stratification in BS. Since the proposed predictive model showed an improved performance with respect to previous works in the field, it is presented as a potential complementary instrument to better identify those asymptomatic patients at risk that may benefit from a defibrillator implantation.

Classifier	Performance (AUC)	Final features
<i>Exercise</i>	0.89 ± 0.03	31
<i>HUT</i>	0.88 ± 0.06	31
<i>Night</i>	0.95 ± 0.03	26
<i>Exercise + HUT</i>	0.91 ± 0.04	30
<i>Exercise + Night</i>	0.84 ± 0.08	26
<i>HUT + Night</i>	0.89 ± 0.04	23
<i>Exercise + HUT + Night</i>	0.92 ± 0.04	60