

Blunted reactivity to stress – a possible pathomechanism of cardiovascular complications in adolescent hypertension?

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Introduction: Altered physiological reactivity to stress is a well-known indicator of an increased risk for cardiovascular diseases. One of possible consequences of impaired cardiovascular regulation is elevated blood pressure. Hypertension is commonly associated with excessive sympathetic activity, however, the methods of the non-invasive assessment of sympathetic regulatory outputs are limited. Therefore, we aimed to study complex cardiac sympathetic control using novel promising method of nonlinear analysis of heart rate variability (HRV) - symbolic dynamics - at rest and in response to physiological stress in adolescents with newly diagnosed essential and white-coat hypertension.

Methods: The studied groups consisted of thirty adolescent boys with newly diagnosed essential hypertension (16.9±0.2 years, body mass index (BMI) 22.9±0.4 kg/m²), thirty adolescents with newly diagnosed white-coat hypertension (16.8±0.3 years, BMI 22.6±0.5 kg/m²) and thirty healthy adolescent boys (16.2±0.4 years, BMI 22.1±0.4 kg/m²). Continuous recording of RR-intervals using DiANS PF8 (Dimea, Czech Republic) was performed in supine position and during active orthostatic test (duration of each phase: 6 minutes). Sympathetic modulation of cardiac autonomic control was assessed using nonlinear analysis of HRV complexity - symbolic dynamics – where index 0V% (zero variation of HRV) is considered to reflect beta-adrenergic sympathetic regulation.

Results: The cardiac beta-adrenergic sympathetic index 0V% was significantly increased during supine position in both white-coat and essential hypertension groups compared to control group (p<0.05 for both). The reactivity (percentual increase) of 0V% to active orthostatic test was significantly lower in white-coat and essential hypertension groups compared to control group (p<0.05 for both). No significant between-groups differences were found in absolute values of 0V% during orthostatic test.

Conclusions: The novel method of nonlinear HRV analysis symbolic dynamics was sensitive to detect increased cardiac sympathetic stimulation in both white-coat and essential hypertension during rest. The sympathetic activation in response to orthostatic test was lower in hypertensive groups indicating abnormalities in the cardiovascular stress reactivity. Importantly, both exaggerated and diminished physiological reactivity to stress have been discussed in terms of negative health outcomes. Our findings could help to better understand the changes of sympathetic cardiac regulation in the adolescent hypertension.

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