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Abstract Title: Heart Rate Turbulence and Heart Rate Variability Predict Sudden Cardiac Death in Patients With Congenital Heart Disease

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Background: Heart rate turbulence (HRT) and heart rate variability (HRV) are powerful ECG related risk predictors for mortality in chronic heart failure and after myocardial infarction. No data exist regarding the predictive value of HRT and HRV in patients with congenital cardiac disease (CCD). The objective of the current study was to assess the prognostic value of HRT and HRV for risk stratification in adolescents or adults with CCD.
Methods and Results: 43 patients with CCD, aged 13-72 years, were included in this prospective clinical study. Parameters of HRT (Turbulence onset = TO, Turbulence slope = TS) and HRV (standard deviation of all normal-to-normal intervals = SDNN, standard deviation of mean values for all normal-to-normal intervals over 5 minutes = SDANN and square root of the mean square differences of successive RR intervals = RMSSD) were calculated from a Holter-ECG. In addition serum brain natriuretic peptide (BNP) was measured and clinical functional class (FC I-IV) was determined. All cause mortality or cardiac arrest were used as study end points.
The mean clinical follow up was 27 ± 12.7 months. Five patients died during follow-up, another two patients were successfully resuscitated. Six of these patients had abnormal TO and TS values. On univariate analysis, BNP value (p=0.002), uric acid (p=0.0045), cortisol (p=0.0003), TS (p=0.0135), SDNN (p=0.004), SDANN (p=0.005), HRVTI (p=0.009), abnormal TO or TS (p=0.007, p=0.002) as well as abnormal TO and TS (p=0.0001) were associated with impaired prognosis. On multivariate analysis abnormal TO and TS was found to be the strongest independent risk stratifier (hazard ratio 61.5, p=0.0002).
Conclusion: The present study verifies for the first time the prognostic value of HRT and HRV in patients with congenital cardiac disease. Our data indicate that HRT and HRV predict survival in unselected CCD patients with various diagnoses. In addition, our results suggest that HRT may even be a stronger prognostic predictor than established markers of cardiac autonomic dysfunction like HRV. The combined use of HRT, HRV and markers of neurohormonal activation like BNP may further improve the prognostic value.

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