Heart rate variability is related to disease severity in children with pulmonary hypertension

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Background: Pulmonary hypertension (PH) is characterized by progressive pulmonary vascular remodeling and consecutive elevation of pulmonary vascular resistance and pressure that may result in chronic right heart failure, which is associated with an increase in sympathetic tone. This may adversely affect cardiac autonomic control. We aimed to assess whether parameters of heart rate variability (HRV) are related to disease severity in children with pulmonary hypertension.

Methods: Parameters of HRV [SDNN = standard deviation of normal-to-normal intervals, SDANN = standard deviation of mean values for normal-to-normal intervals over 5 min, rMSSD = square root of the mean square differences of successive RR intervals, and pNN50 = proportion of the number of pairs of successive normal-to-normal intervals that differ by more than 50 ms divided by total number of normal-to-normal interval] were determined from Holter electrocardiograms of 17 patients with PH (10 female, mean age 12.8 ± 8.7 years). 13 of the 17 patients had idiopathic PAH, 3 patients had associated chronic lung disease, one had recurrent pulmonary vein stenosis. An additional group of 5 adolescents with Eisenmenger syndrome (EMS) was included.

Results: Patients were allocated to 2 groups according to their disease severity: (1) Patients with severe PH (ratio of PAP/SAP >0.75) (n=6), (2) patients with mild PH (PAP/SAP ratio <0.75) (n=11). Children of group 1 had significantly lower values of HRV [SDNN (73.8 ± 21.1 vs. 164.9 ± 38.1), SDANN (62.2 ± 19.0 vs. 139.5 ± 33.3), rMSSD (31.0 ± 8.7 vs. 73.6 ± 22.7), and pNN50 (5.8 ± 3.4 vs. 28.0 ± 8.8)] compared to group 2 (p<0.0001 for all). SDNN inversely correlated with ratio of PAP/SAP (r=-0.838; p<0.001). EMS patients showed no significant difference of HRV [SDNN 157.6 ± 43.2, SDANN 141.2 ± 45.3, rMSSD 66.8 ± 16, and pNN50 18 ± 11.6] compared to patients of group 2 (p >0.05 for all).

Conclusions: According to our results, children with severe PH may have alterations in HRV. Since HRV appears to be related to disease severity, it may therefore serve as an additional diagnostic marker of PH. Remarkably, although EMS patients have suprasystemic pulmonary arterial pressures, they seem to have preserved HRV, which might reflect a more favourable autonomic adaptation.