

Effects of methylphenidate treatment on the heart rate variability in patients with attention deficit and hyperactivity disorder

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Introduction: Methylphenidate (MPH) is a psychostimulant drug and commonly used for attention deficit and hyperactivity disorder (ADHD). It has been reported that the sympathomimetic effects of methylphenidate may cause disturbances in cardiac rhythm.

Methods: Heart rate variability (HRV) analyses were performed to all patients before and at the end of first month of MPH treatment by 24-hr rhythm Holter. Control group consisted of age and gender matched healthy children. Heart rates, maximal QT and QTc durations were analyzed. The time-domain analysis included average heart rate, standard deviation of all normal sinus RR intervals over 24 h (SDNN), standard deviation of average NN intervals (SDANN), SDNN-index, percentage of successive normal sinus RR intervals >50 ms (pNN50) and root-mean-square of the successive normal sinus RR interval difference (rMSSD). The following frequency domain analysis indices were obtained: total power (TP), low frequency (LF) power, high frequency (HF) power, and LF/HF ratio.

Results: A total of 33 patients (24 boys, 9 girls) and 36 healthy control subjects (21 boys, 15 girls) were enrolled in this study. The mean age of the patients and controls were 9.7 ± 2.6 years and 9.5 ± 2.8 years, respectively ($p > 0.05$). The mean average heart rate before and after MPH treatment was 93.9 ± 8.5 and 95.9 ± 9.3 , respectively. While the minimum, maximum and average heart rate were similar between two groups before MPH treatment ($p > 0.05$) only maximal QTc duration was significantly increased under MPH treatment in the ADHD patients (mean 452.8 ± 19.1 ms and 442.9 ± 14 ms, respectively; $p = 0.02$) (Table). The comparison of pre- and post-treatment 24-h HRV analyses with the values of control group demonstrated no significant differences both in all time and frequency domain parameters ($p > 0.05$). Also, no significant arrhythmia was detected in the Holter recordings.

Conclusions: ADHD seems not to have a significant effect on HRV in children. Also, in contrast to majority of the previous studies, MPH treatment did not affect the HRV significantly in our study. However, increase in maximal QTc duration was statistically significant after MPH treatment.

	Controls (n = 36)	Pre-treatment (n = 33)	P value	After treatment (n = 33)	P value
Average HR (beats/min)	90 ± 11.7	89.3 ± 8.6	>0.05	91.2 ± 9.4	>0.05
Max. QT (ms)	428.5 ± 13.2	428.2 ± 15	>0.05	430.5 ± 16.2	>0.05
Max. QTc (ms)	442.9 ± 14	449.6 ± 13.8	>0.05	452.8 ± 19.1	0.02
SDNN	131.5 ± 43.1	137.1 ± 33.5	>0.05	133.7 ± 36.5	>0.05
SDANN	112.4 ± 41.4	121.7 ± 32.7	>0.05	120.2 ± 38.6	>0.05
SDNNi	64.5 ± 19.7	65.8 ± 18.1	>0.05	63.2 ± 18	>0.05
RMSSD	44 ± 16.1	46.3 ± 18.2	>0.05	45.3 ± 18.5	>0.05
PNN50	18.4 ± 10.7	19.1 ± 10.3	>0.05	19.2 ± 12	>0.05
TP	4296 ± 2601	4401 ± 2178.8	>0.05	4014 ± 1983	>0.05
LF	892.8 ± 464.4	993.2 ± 509.8	>0.05	875.1 ± 433.6	>0.05
HF	568.1 ± 293.3	657.1 ± 384.1	>0.05	619.6 ± 367.1	>0.05
LF/HF	1.7 ± 0.5	1.9 ± 1.1	>0.05	1.8 ± 1.1	>0.05