Selective and Unselective Blockade of Sympathetic and Parasympathetic and Vagal Enhancement by Pirenzepine: Effects on Heart Rate and Heart Rate Variability in Healthy Subjects

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Methods: In 25 healthy volunteers (f = 12, m = 13, age 40 ± 12 yrs.) we studied the influence of selective and unselective blockade of the autonomic nervous system on heart rate (HR) and HR variability (HRV). Data were recorded after an interval for rest lasting 20 min. and cardiovascular variables were observed to be stable. The examinations were performed in supine position, at constant room temperature and at identical times of the day with respiratory intervals of 5 seconds (0.2 Hz, 12 breaths/min). Afterwards the following parameters were determined at 4 consecutive surface-ECG recordings over 10 minutes each: heart rate (HR), standard deviation of R-R intervals (sd), spectral analysis of HR variability (HRV) at the very low frequency range (VLF), low frequency range (LF), high frequency range (HF), total power spectral density (PSD) (ms²/Hz) and LF/HF-ratio. Following baseline measurements, unselective beta receptor blockade (BB) with i.v. esmolol, low dose application of pirenzepine (Pir.) i.v., and a complete autonomic blockade with i.v. atropine were carried out. Level of significance p<0.05*, Wilcoxon-test.

Results: Significant decrease in HR and increase in sd were found after BB with further decrease in HR and increase in sd after additional application of pirenzepine. Changes concerning the parameters of HRV spectral analysis were observed first after Pir. (with increase in VLF-range, LF-range and total PSD) but not after BB. To our surprise we did not see any alteration in the HF-range.

Conclusions: In our examination BB produced changes in HR and sd, but not in parameters of HRV spectral analysis. The further observed changes in HR, sd and spectral components of HRV (increase in VLF, LF, total PSD) after application of the cholinergic antagonist pirenzepine in low dose are caused by enhanced vagal influence on heart rate regulation, mediated by selective M1-cholinoreceptor blockade.