Heart Rate Asymmetry (HRA) in Altered Parasympathetic Nervous System Activity

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Heart rate asymmetry (HRA) was defined as a visible and quantifiable phenomenon in resting healthy people using Poincaré plot. In our pervious study, HRA has been defined considering geometry of the Poincaré plot to better estimate the HRA in healthy subjects. Based on the proposed definition, traditional asymmetry indices - Guziks index (GI), Portas index (PI) and Elhers index (EI) have been redefined. This study was designed to asses the changes in HRA using Poincaré plot during different phases of perturbation in parasympathetic activity. Eight subjects (age: 30.5 ± 7.3 yr) with normal sinus rhythm, did not smoke, had no cardiovascular abnormalities and were not taking any medications were studied. Parasympathetic perturbations were achieved by Atropine infusion (parasympathetic blockade) and scopolamine administration (parasympathetic enhancement) phase apart from baseline (normal) phase. The redefined Guziks index (GIp) was calculated for each subjects in each phase of the experiments. Then the asymmetry was calculated as at least 1% deviation from the symmetry value in either direction. Moreover, absolute distance from the symmetry range was calculated as Distsym to observe the changes in asymmetry index rather than subjective screening. In baseline phase the heart rate variability (HRV) of 87.50% subjects (7 out of 8) were found asymmetric which reduced to 62.50% (5 out of 8) during atropine infusion. In contrast, 100% (8 out of 8) subjects were found to be asymmetric during scopolamine administration phase. These findings suggest that screening of HRA changes harmoniously with change in parasympathetic activity of autonomic nervous system. Mean Distsym was also highest during scopolamine administration phase while it was lowest during atropine infusion phase. This suggests that mean distance from symmetric range increases with enhancement in parasympathetic activity and decreases during parasympathetic blockade. Hence, we can conclude that HRA changes with change in parasympathetic activity harmoniously.