

# **Perturbation in Parasympathetic Nervous System Activity Affects Temporal Structure of Poincaré Plot**

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The Poincaré plot of RR intervals is one of the most popular techniques used in heart rate variability (HRV) analysis. A novel descriptor (Complex Correlation Measure (CCM)) for measuring the variability in the temporal structure of Poincaré plot has been developed to characterize or distinguish between Poincaré plots with similar shapes. The aim of this study was to assess the changes in temporal structure of the Poincaré plot using CCM during atropine infusion (parasympathetic blockade) and transdermal scopolamine patch administration (enhanced parasympathetic activity) phases. The change in CCM values during these autonomic perturbation phases revealed the physiological relevance of the new descriptor. In this study, five subjects with normal sinus rhythm, did not smoke, had no cardiovascular abnormalities and were not taking any medications were studied. Short-term variability (SD1) (mean (ms)  $\pm$  sd (ms)) was highest ( $69.90 \pm 21.25$ ) in Scopolamine phase and minimum ( $4.45 \pm 2.45$ ) in Atropine phase. Similar trend was also found for long-term variability (SD2), ( $103.05 \pm 20.05$ ) and ( $43.11 \pm 13.79$ ) in scopolamine and atropine phase respectively. CCM also showed minimum value in Atropine phase ( $3.88E-02 \pm 1.05E-02$ ) and maximum at Scopolamine phase ( $2.75E-01 \pm 2.14E-02$ ). However, Changes in mean values of CCM between study phases were higher than both SD1 and SD2. The change in CCM value indicates that CCM might correlate the parasympathetic nervous system activity as similar change in SD1 quantifies the vagal modulation of heart rate. Moreover, CCM conveys information about the temporal structure of the Poincaré plot and more sensitive to the changes in temporal structure of the plot compared to SD1 and SD2. This higher sensitivity in CCM values for Poincaré plot with small number of RR intervals might enhance the applicability of CCM to short term time series signal.