Decreased Complex Correlation Measure of Poincaré Plot in Patients with Depression

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Heart rate variability (HRV) is reduced in patients with Major Depressive Disorder (MDD) and is also a robust marker of future cardiac mortality. Previous work of ours has shown that nonlinear HRV measures may be more sensitive for identifying people with MDD in comparison to other HRV measures. In this study we examined the sensitivity of a new nonlinear parameter, the Complex Correlation Measure (CCM) in patients with depression relative to age- and sex-matched controls. The Complex Correlation Measure (CCM) measures the variability in the temporal structure of Poincaré plot, which can characterize or distinguish plots with similar shapes. It measures the point-to-point variation of the signal rather than the gross description (SD1 and SD2) of the Poincaré plot. It is computed in a windowed manner, which embeds the temporal information of the signal. A moving window of three consecutive points from the Poincaré plot was considered and the temporal variation of the points was measured. CCM is more sensitive than SD1 and SD2 to changes of parasympathetic activity. SD1. SD2 and CCM were derived from two-minute electrocardiogram recordings under eyes open and eyes closed conditions. CCM is sensitive to the rate of change of the temporal structure of the time-series signal. CCM values were found to be 0.36 ± 0.1 in control and 0.29 ± 0.1 in depressed patients indicating a decrease in the temporal variability associated with a decrease in parasympathetic function (Cohens d = .7, p=0.0008). CCM also demonstrated a larger effect size or greater sensitivity than SD1 (Cohens d = .5, p =0.0005) and SD2 (Cohens d = 0.2, p = 0.015). These results highlight that depressed patients display a dampening of oscillations between parasympathetic and sympathetic input indicative of reduced functionality and increased risk of sudden cardiac death. CCM is a more sensitive nonlinear measure of HRV, which provides additional information to SD1 and SD2 of the Poincaré plot distribution.