

Sudden Cardiac Death Prediction in Chronic Heart Failure Patients by Periodic Repolarization Dynamics

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Background: Early risk stratification of chronic heart failure (CHF) patients is important to guide therapy and reduce costs. CHF is associated with autonomic imbalance characterized by increased sympathetic activity and withdrawal of parasympathetic activity. Periodic Repolarization Dynamics (PRD), quantifying low-frequency oscillations in the T-wave of the electrocardiogram (ECG), has been proposed as a marker of sympathetic modulation of ventricular repolarization. The aim of this study is to assess the capacity of PRD to predict sudden cardiac death (SCD) in a population of CHF patients.

Materials and Methods: Twenty-minute high-resolution orthogonal-lead ECG recordings of 569 patients with symptomatic CHF and normal sinus rhythm from the MUSIC study were analyzed. The study group included 53 victims of SCD, 53 victims of pump failure death, 37 non-cardiac deaths and 426 survivors after a 4-year clinical follow-up. A PRD value was computed in 5-minute segments with 4-minute overlap, by applying phase-rectified signal averaging to the series of angular differences between consecutive T-waves. For each patient, median PRD over segments was computed. Three thresholds were selected for PRD dichotomization, corresponding to 25th, 50th and 75th percentiles in the study population.

Results: PRD was higher in SCD victims than in all other subgroups. When PRD was dichotomized at 1.10, 1.76 and 2.84 deg, hazard ratios [CI] from univariate Cox regression analysis were: 2.239 [1.011-4.959], $p=0.047$; 1.808 [1.031-3.169], $p=0.039$; and 1.134 [0.624-2.062], $p=0.680$, confirming the first two dichotomized PRD variables as SCD predictors. Kaplan-Meier survival probability estimation confirmed SCD risk stratification power of PRD dichotomized at 1.76 deg (Figure 1).

Conclusion: Increased PRD is associated with increased risk of SCD in CHF patients.

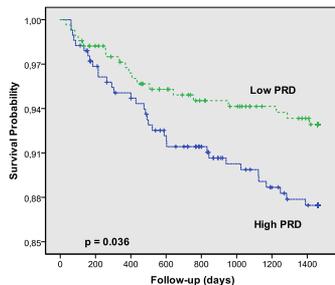


Figure 1 - Kaplan-Meier SCD survival probability curves for a PRD threshold of 1.76 deg.