

T-wave Alternans from Holter Recordings to Stratify Patients with Chagas Cardiomyopathy

João Paulo Madeiro¹, Alba Martín-Yebra², Roberto C. Pedrosa³, Pablo Laguna², Juan Pablo Martínez²

¹ Depart. of Computing, Federal University of Ceará, Fortaleza, Brazil

² I3A, University of Zaragoza, Zaragoza, Spain

³ HUCFF, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil

Introduction: Chagas Disease (ChD) is a tropical disease endemic in Latin America, where the majority of the estimated 6-8 million people infected with the *T. cruzi* parasite reside. During the course of ChD, 30% of the subjects develop Chronic Chagas Cardiomyopathy (CCC), a potentially fatal arrhythmogenic condition, with sudden cardiac death (SCD) the main cause of death (55%-65%). The present work proposes the assessment of the predictive potential of T-wave alternans (TWA) indices for SCD events within CCC patients considering a 4-year follow up, applied over 24-hours Holter recordings.

Methods: TWA waveforms are estimated in processable 128-beat segments using a combination of Periodic Component Analysis (π CA) and the Laplacian likelihood ratio (LLR) techniques. The Index of Median Alternans (V_{IMA}) is computed as the mean absolute voltage of the median alternans waveform, both computed in the complete recording and with a cumulative heart-rate (HR) strategy, from 40 to 140 bpm. We compute the TWA from those k :th segments with mean heart rate ($\overline{HR}_k$) lower than a particular HR_b , named $V_{IMA}^C(HR_b)$. This implies to cumulatively group segments in a cluster $\mathcal{C}_b \equiv \{\overline{HR}_k < HR_b\}$.

Results: SCD patients showed significantly higher values of V_{IMA} ($p=0.009$) and, more significantly, higher values of $V_{IMA}^C(77.5)$ ($p=0.006$) than survivor patients. Univariate Cox analysis showed that V_{IMA} and $V_{IMA}^C(77.5)$ are significantly associated with SCD risk, (HaR = 2.36, 95% CI: 1.44-3.87, $p=0.001$) and (HaR = 2.46, 95% CI: 1.48-4.08, $p < 0.001$), respectively. Event-free curves for SCD concerning the referred predictive indices are shown in Fig. 1.

Conclusion: TWA indices both computed globally or cumulatively up to specific HR-related values, specially for HRs lower than 77.5 bpm, are strongly associated with SCD in Chagas patients. The potential of these TWA indices for predicting SCD in CCC patients can be explored to support decision-making in implantable cardioverter-defibrillator (ICD) indication.

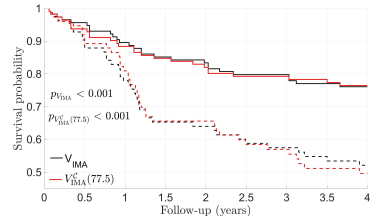


Fig.1: Survival probability curves of SCD associated with V_{IMA} and $V_{IMA}^C(77.5)$.