

Multipole Heart Rate Variability Analysis as a Predictor of Ventricular Arrhythmias in ICD Patients

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Background: Ventricular tachyarrhythmia (VTA) causing sudden cardiac death (SCD) is a major cause of mortality in the western world. Contemporary implantable cardiac defibrillators (ICD) enable collection and storage of multiple, pre-episode R-R interval recordings in patients who suffered from VTA. Timely prediction of VTA, using heart rate variability (HRV) analysis processing techniques, may allow time to implementation of preventive and therapeutic strategies.

Aim: To evaluate the novel multipole method of HRV analysis in prediction of imminent VTAs in ICD patients.

Methods: Our study population consisted of patients from the Biotronik HAWAII Registries (Heart Rate Analysis with Automated ICDs). Total of 28 patients from the HAWAII registry, having full medical records, who had experienced documented, verified VTA during the 2 year follow-up period, were included in our analysis. HRV during pre-episode recordings of 4500 R-R intervals from those patients was analyzed using the multipole method and compared to HRV of similar length recordings of the same patients that were not followed by arrhythmia. We used the combination between quadrupoles and the Dyx parameters to reveal early signs predicting imminent VTA in our patients.

Results: Our study population consisted of 28 patients, mainly men (89%), average age of 64.8 ± 9.4 , 92% with coronary artery disease. HRV during 64 pre-event recordings (2.3 events per patient on average) were analyzed and compared with 60 control recordings. The multipole method of HRV analysis showed 50% sensitivity and 91.6% specificity for prediction of VT/VF in the study population, with 84.5% positive predictive value. No statistically significant correlation was found between various clinical parameters and the pre-detection of imminent VTA in our patients.

Conclusion: The multipole method of HRV analysis emerges as a possible predictor of imminent VTA, providing an early warning that can be used to prepare for an arrhythmic episode.