Fragmented QRS complex as a predictor of all-cause mortality in patients undergoing cardiac resynchronization therapy

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Introduction: Heart failure with reduced left ventricle ejection fraction (HFrEF) is a prevalent entity with poor prognosis in the follow-up. Cardiac resynchronization therapy (CRT) in specific situations, have demonstrated to reduce all-cause mortality in this group of patients. However, these patients represent a highly heterogeneous group, so risk stratification is crucial in the approach of these patients. In the recent years, specific electrocardiographic findings such as fragmentation of the QRS complex (fQRS) have been reported as potential prognostic factors in different cardiac conditions, but the role in patients undergoing CRT is unclear.

Purpose: The aim of this study is to determine if the presence of pre-implantation fQRS in 12-lead surface electrocardiogram (ECG) predicts all-cause mortality in patients undergoing CRT implantation.

Methods: Consecutive patients undergoing CRT implantation (with or without defibrillator) were prospectively included from October 2009 to December 2022. Demographic, clinical, electrocardiographic and echocardiographic variables as well as outcomes in the follow-up period were recorded from electronic clinical records and telephone interview. Fragmentation of the QRS complex was defined by the presence of different RSR′ patterns including an additional R-wave (R′), notching of the R-wave and S-wave or the presence of more than 1R′ in two contiguous leads corresponding to a main coronary artery territory.

Results: Finally, 244 patients were included. Mean age at device implantation was 71.8 years (standard deviation, SD ±9.8 years), 79.5% were male and 40.2% were diabetic. Mean left ventricle ejection fraction (LVEF) at baseline was 24.9% and the aetiology was non-ischaemic in 50.8% of the patients and ischaemic in 49.2%. 40.2% had prior history of acute myocardial infarction. Pre-implantation fQRS was found in 58.6% of the patients and mostly in inferior leads. CRT with defibrillator implantation was performed in 71.4% of the patients. The median follow-up time was 27.4 months. At the end of this period, mean LVEF was 33.2% and 76.6% presented NYHA class I-II. 28.7% of the patients died during the follow-up. A multivariate survival study using Cox regression revealed that the only variables were associated with death from any cause were maintaining NYHA functional class III-IV, the aetiology of the LV systolic dysfunction and pre-implantation fQRS. Specifically, the presence of pre-implantation fQRS in the surface ECG was a powerful predictor for all-cause mortality (HR 2.62; 95% CI 1.40-4.91). Kaplan-Meier curves for all-cause mortality are presented in Figure 1.

Conclusions: According to our results pre-implantation fQRS in the surface ECG is a powerful independent predictor of all-cause mortality in patients undergoing CRT implantation. Consequently, these patients could benefit from stricter follow-up. However, further studies are required to support our results.
Figure 1. Kaplan-Meier curves.