

Relationship between ventricular repolarization parameters and the inducibility of ventricular arrhythmias during electrophysiological study in patients with coronary artery disease

Introduction: Malignant ventricular arrhythmias (MVA) often culminate in sudden cardiac death (SCD), and up to 80% of the cases occur in patients with pre-existing coronary artery disease (CAD). Therefore the identification of risk predictors is of fundamental importance. Currently, the parameter used daily for this purpose is the left ventricular ejection fraction (LVEF), which, however, has limited sensitivity, since, in absolute numbers, most cases occur in patients without significant ventricular dysfunction. In recent decades, parameters of ventricular repolarization have proven to be useful tools in stratifying the risk of death in various clinical conditions. **Objective and Methods:** This was a cross-sectional study that included patients with CAD who underwent electrophysiological study (EPS) in a tertiary hospital with the aim to evaluate the association between ventricular repolarization parameters measured on 12-lead ECG and inducibility of MVA during programmed electrical stimulation. **Results:** 177 consecutive patients were analyzed. Mean age was 65 ± 10.1 years and 83.6% were male. Mean LVEF was $37.5 \pm 13.6\%$ ($< 35\%$ in 53.1%); 76.8% had history of acute coronary syndrome (ACS) and previous aborted SCD occurred in 16.9%. For each 10 ms increment in the QT interval, an increase of 7% in MVA inducibility was observed. The QT cutoff point of 452 ms had an accuracy of 0.611 ($p = 0.011$) for the proposed outcome. Male gender (OR = 4.18, $p = 0.012$), LVEF $< 35\%$ (OR = 2.32, $p = 0.013$), amiodarone use (OR = 2.01, $p = 0.038$) and the QT interval (OR = 1.07, $p = 0.023$) were independent predictors for MVA induction. In the subgroup of patients with previous ACS, QT interval remained associated with arrhythmic induction on EPS ($p = 0.013$) in the univariable analysis; in addition, QT interval above 432 ms performed an AUC of 0.628 ($p = 0.009$). When the LVEF and QT interval variables were evaluated together, using the cutoff point of 452 ms, prolongation of the QT associated with significant ventricular dysfunction increased the risk of MVA (OR = 5.44, $p = 0.0004$). In the subgroup of patients with LVEF $\geq 35\%$, QT dispersion (QTd) was significantly higher in those with inducible MVA. QTd > 20 ms had an accuracy of 0.638 in predicting MVA, with an 81.3% negative predictive value (95% CI 63 – 92.1%). The other evaluated ventricular repolarization parameters were not associated with the outcome, even after adjustments for previous ACS and LVEF. **Conclusion:** The QT interval was an independent risk predictor of MVA inducibility in patients with CAD including the subgroup with previous ACS. The combination of ventricular dysfunction and prolonged QT interval was associated with a 5.44-fold increase in MVA induction. Male gender, amiodarone use and decreased LVEF were also related to MVA inducibility on EPS.

Keywords: Cardiac arrhythmias, Electrocardiography / Methods, Electrophysiology, Coronary Artery Disease, Sudden Cardiac Death

Table – Multivariable analysis of parameters associated with MVA induction on EPS using the cutoff indicated by the ROC curve

Variable	Classification	p*	OR*	95% CI
Gender	Female			
	Male	0.012	4.18	1.45 – 12.05
Amiodarone use	No			
	Yes	0.038	2.01	1.04 – 3.89
Ejection fraction (%)	≥ 35			
	< 35	0.013	2.32	1.20 – 4.48
QT† (ms)	≤ 452			
	> 452	0.004	2.70	1.37 – 5.36

*Logistic regression model and Wald's test; $p < 0.05$

†Cutoff point indicated by the ROC curve

Subtitle:

MVA – Ventricular malignant arrhythmias

EPS – Electrophysiological study

ROC – Receiver operating characteristic

p – p value

OR – Odds ratio

95% CI – 95% confidence interval

ms – milliseconds