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Arrhythmias

SCREENING FOR ARRHYTHMOGENIC MYOCARDIAL SUBSTRATE BY 12-LEAD ECG QRS SCORE, QRS-T ANGLE, LATE POTENTIALS AND T-WAVE ALTERNANS

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Background: Increased QRS score, wide spatial QRS-T angle, T-wave alternans (TWA), and late potentials are independent predictors of cardiovascular mortality in the general population. We analyzed whether these electrocardiographic (ECG) parameters enable screening of patients for myocardial scar features implicated in sudden cardiac death risk.

Methods: We screened the entire 12-lead ECG database of Johns Hopkins Hospital and identified 631 patients age ≤70 years from non-critical care areas and no record of reduced life expectancy who had QRS score ≥5 and/or spatial QRS-T angle ≥105° as well as left ventricular ejection fraction (LVEF) ≥35%. All individuals were invited to participate and 69 enrolled in the study and underwent clinical examination, signal averaged ECG (SAECG), 30-minute ambulatory ECG recording for TWA, and complete contrast-enhanced cardiac magnetic resonance (ce-CMR) study to determine scar presence and pattern, as well as to characterize gray zone, core, and total scar size.

Results: In the 69 patients (mean age 61±9, 71% male, 18% with a prior history of myocardial infarction and 32% with prior history of coronary revascularization) the mean LVEF was 57±8%. Myocardial scar was present in 38 (55%) patients, of whom 19 (50%) exhibited a typical ischemic pattern. Median and inter-quartile range for scar, core scar, and gray zone extent were 8% [4; 15%], 5% [3; 8%], and 2.5% [1; 7%] of left ventricle (LV) respectively. QRS score but not QRS-T angle was related to total scar size and gray zone size (P=0.02). There was a significant association between TWA and myocardial scar core size, (R=0.42; P=0.001). On multivariable analysis, only LV end-systolic volume (beta=0.18; 95%CI[0.03-0.33]; P=0.02) and total myocardial scar mass (beta=1.07; 95%CI[0.44-1.71]; P=0.001) were significantly associated with TWA. Presence of late potentials was related to depressed LVEF and QRS score but not to total scar extent.

Conclusions: Screening with QRS score identifies preserved LVEF patients with myocardial scar and elevated TWA, consistent with arrhythmogenic myocardial substrate