

The problem of indeterminate microvolt T-wave alternans results in patients with left ventricular dysfunction referred for implantable cardioverter-defibrillator implantation in the primary prevention of sudden cardiac death

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Abstract

Background: Microvolt T-wave alternans (MTWA) is a recommended noninvasive diagnostic test for predicting the risk of sudden cardiac death (SCD). However, about 6% to 41% of MTWA results are indeterminate. The causes, interpretation and clinical significance of these results have not been not clearly established.

Aim: To assess frequency, causes, and prognostic significance of indeterminate MTWA results in a group of patients with left ventricular dysfunction referred for implantable cardioverter-defibrillator (ICD) placement in the primary prevention of SCD.

Methods: Patients with left ventricular ejection fraction (LVEF) $\leq 35\%$ underwent MTWA evaluation during a treadmill exercise test (CH2000 system, Cambridge Heart Inc. Bedford MA, USA). MTWA results (spectral analysis) were categorised as positive, negative, or indeterminate (MTWA_{pos}, MTWA_{neg}, and MTWA_{ind}, respectively). Patients were followed up for the occurrence of SCD, ventricular tachycardia (VT), and ventricular fibrillation (VF).

Results: Mean age of participants ($n = 93$) was 63 ± 13 years, an ischaemic cause of left ventricular dysfunction was present in 70 (75%) patients, and average LVEF was $30 \pm 7\%$. MTWA_{pos} was found in 27 (29%) patients, MTWA_{neg} in 41 (44%) patients, and MTWA_{ind} in 25 (27%) patients. Causes of MTWA_{ind} included inability to achieve a diagnostic HR in 12 (48%) patients, ventricular ectopy in 5 (20%) patients, nonsustained alternans in 3 (12%) patients, and technical factors (artifacts due to a high noise level) in 5 patients (20% of indeterminate results, 5.4% of the whole study group). During follow-up, 8 SCD/VT/VF events were noted (4 patients with MTWA_{pos} and 4 patients with MTWA_{ind} due to patient-related factors). The rate of SCD/VT/VF was 35% in patients with MTWA_{pos} and 34.6% in MTWA_{ind} due to patients-related factors, significantly higher compared to those with MTWA_{neg} or MTWA_{ind} due to technical factors ($p < 0.05$).

Conclusions: Although the proportion of indeterminate MTWA results in patients with left ventricular dysfunction referred for ICD implantation in the primary prevention of SCD was high, the proportion of indeterminate MTWA results due to technical factors, probably of no prognostic significance, was small.

Key words: microvolt T-wave alternans (MTWA), implantable cardioverter-defibrillator (ICD), systolic dysfunction

Kardiol Pol 2012; 70, 8: 795–802

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Received: 12.08.2011 Accepted: 04.04.2012

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