Author’s Reply

T Wave Alternans Detected in Defibrillator Electrograms: Reply

We appreciate the interest expressed in our study1 by Dr Madias. He had several questions regarding the relationship between the amplitude of the T wave and the T wave alternans (TWA) on implantable cardioverter defibrillator (ICD) electrograms. His first question was whether the amplitude of the T wave increased more prior to the onset of spontaneous ventricular tachycardia (VT)/fibrillation (VF) than immediately after induced VT or inappropriate ICD shocks. Second, he queried whether the amplitude of TWA in μV preceding spontaneous VT was larger in patients with ischemic rather than non-ischemic cardiomyopathy or in patients with idiopathic ventricular fibrillation. His third question was whether the magnitude of the TWA was larger before spontaneous VT than before induced VT in patients with ischemic cardiomyopathy. Fourth, he also posed a question about the amplitude of TWA immediately after inappropriate ICD shocks in patients with spontaneous VT/VF. Dr Madias reported that TWA may be T-wave-amplitude dependent;2–4 and he has also posed similar questions about the relationship between T wave amplitude and TWA in other journals in the form of Letters to the Editor.4,5

Theoretically, the T wave amplitude on surface 12-lead electrocardiography (ECG) is determined by the direction of the repolarization vector and the transmural repolarization gradient or apicobasal repolarization gradient. Therefore, discordant alternans of repolarization, which precede spontaneous VT/VF, are not dependent on the T wave amplitude. To address Dr Madias’ questions, we performed additional analyses of T wave amplitudes and TWA on ICD electrograms. T wave amplitudes prior to spontaneous VT/VF (VTClinic), immediately after ICD shock to induce VT (VTInduced), and immediately after inappropriate ICD shock (ShockInduced) were 272.7±127.9 μV, 342.2±250.7 μV, and 292.7±151.2 μV, respectively (P=NS). We did not find a correlation between T wave amplitude and TWA in these 3 groups (P=NS). We also compared T wave amplitude among disease groups, and at different times in the same patient (VTClinic vs VTInduced), but found no statistically significant differences. Therefore, our data suggest that changes in the T wave amplitude on ICD electrograms do not accurately predict either TWA or VT/VF. Our findings1 are consistent with those of Swerdlow et al who analyzed the TWA and T wave amplitudes on ICD electrograms preceding VT episodes.6,7 Shusterman et al who reported that on the ECG TWA increases prior to VT/VF but that the ECG T-wave amplitude does not6 and Narayan and Ahn who stated that TWA may arise even with low-amplitude T waves.6 However, our study was not designed to address this issue and had the limitations of a small number of patients, local ICD electrograms, and multiple ICD models. We also excluded ICD electrograms with a T wave amplitude <10 μV or an ambiguous T wave ending. Therefore, further investigation of Dr Madias’ hypothesis may be warranted.

In summary, we suggest that although the TWA on an ICD electrogram is significant immediately before spontaneous VT, it does not appear to correlate with T wave amplitude and TWA.

References


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