



Anger-Induced T-Wave Alternans Predicts Future Ventricular Arrhythmias in Patients With Implantable Cardioverter-Defibrillators

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Objectives: This study sought to determine whether T-wave alternans (TWA) induced by anger in a laboratory setting predicts future ventricular arrhythmias in patients with implantable cardioverter-defibrillators (ICDs).

Background: Anger can precipitate spontaneous ventricular tachycardia/ventricular fibrillation and induce TWA. Whether anger-induced TWA predicts future arrhythmias is unknown.

Methods: Sixty-two patients with ICDs underwent ambulatory electrocardiography during a mental stress protocol, 3 months after the ICD was implanted. T-wave alternans was analyzed using time-domain methods. After a ≥ 1 year follow-up, ICD stored data was reviewed to determine incidence of ICD-terminated ventricular tachycardia/ventricular fibrillation.

Results: Patients with ICD-terminated arrhythmias during follow-up ($n = 10$) had higher TWA induced by anger, $13.2 \mu\text{V}$ (interquartile range [IQR] 9.3 to $16 \mu\text{V}$), compared with those patients without future ventricular arrhythmias, $9.3 \mu\text{V}$ (IQR 7.5 to $11.5 \mu\text{V}$, $p < 0.01$). Patients in the highest quartile of anger-induced TWA ($>11.9 \mu\text{V}$, $n = 15$) were more likely to experience arrhythmias by 1 year than those in the lower quartiles (33% vs. 4%) and during extended follow-up (40% vs. 9%, $p < 0.01$ for both). In multivariable regression controlling for ejection fraction, prior clinical arrhythmia, and wide QRS, anger-induced TWA remained a significant predictor of arrhythmia, with likelihood in the top quartile 10.8 times that of other patients (95% confidence interval: 1.6 to 113, $p < 0.05$).

Conclusions: Anger-induced TWA predicts future ventricular arrhythmias in patients with ICDs, suggesting that emotion-induced repolarization instability may be 1 mechanism linking stress and sudden death. Whether there is a clinical role for anger-induced TWA testing requires further study.

Key Words: tachyarrhythmias (ventricular) • anger • implantable cardioverter-defibrillator

Abbreviations and Acronyms

ICD = implantable cardioverter-defibrillator

IQR = interquartile range

TWA = T-wave alternans

VT/VF = ventricular tachycardia/ventricular fibrillation

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