LETTERS TO THE EDITOR

QT-Interval Variability and/or T-Wave Alternans

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To the Editor:

It was a pleasure to read the study by Haigney et al. in the January 2009 issue of the *Journal*.¹ The authors evaluated QT-interval variability (QTVI) and T-wave alternans (TWA) both at rest and during bicycle exercise in 47 patients with an implantable cardioverter-defibrillator (ICD) and 23 healthy controls. QTVI at rest correlated with exercise TWA, and exercise QTVI correlated with ejection fraction, and inducible myocardial ischemia. The main clinical implication emanating from this study is that resting QTVI may be suitable for risk stratification of patients expected not to be able, or unable, to undergo submaximal exercise-based TWA assessment. The authors were prudent to suggest that since different physiological processes impact QTVI and TWA, perhaps the former during rest and the latter during exercise implemented in combination may provide complimentary information. TWA was measured as both a continuous score and a categorical variable, employing the established positive, negative, and indeterminate diagnostic criteria. Values of the TWA used in the analysis were based on the electrocardiogram (ECG) lead with the largest TWA magnitude during exercise, but the actual values were not reported by the authors, and the article's Figure 3 includes mV,² instead of μV , in the ordinate. Quantitative reporting of results of TWA evaluation has been encouraged,^{2,3} and the advantages of using continuous measures of TWA are evident by these authors' analysis showing an association of QTVI and TWA. The ICD patients had a 25.5%, 31.9%, and 42.6% positive, negative, and indeterminate TWA test, respectively, during exercise, and QTVI levels for pa-

tients with an indeterminate TWA response were *higher* than TWA-negative patients, and *lower* than TWA-positive patients; although these differences did not reach statistical significance, which may, or may not, represent a type 2 error. Nevertheless, this finding casts doubt on the current approach of "lumping together" positive and indeterminate TWA responses. The authors were careful to note that there may be confounding factors influencing the relationship of TWA and QTVI; perhaps, a larger study may be needed to elucidate this issue. Resolution of the controversy regarding the performance of QTVI versus TWA in predicting vulnerability to malignant ventricular arrhythmia should require quantitative reporting of TWA rather than the current approach of positive/negative dichotomy further encumbered by the *large* "indeterminate" responses. While the authors' "study limitations" and "clinical implications" sections are thoughtfully expressed, it would be prudent to have this group of 47 patients monitored for ventricular arrhythmias and/or appropriate ICD therapy shocks to ascertain the performance of QTVI and TWA, during a longer follow-up. It would be important to evaluate the reproducibility of QTVI and TWA at short- and long-term follow-up, which may be found to be different; such finding may turn out to have significance, probably reflecting the different electrophysiological underpinnings of QTVI and TWA. Finally, since it has been theorized that the magnitude of TWA is T-wave amplitude dependent,⁴ and since the authors analyzed in their study data from the lead with the maximum TWA values, it would be possible for them to provide evidence whether there is (or not) such association, by correlating

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TWA amplitude values in μV with T-wave values in mV, or μV , in their ICD patients and healthy controls.

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