

Can we alternate between T-wave alternans testing methods?

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Summary

MTWA is an exciting and practical method for noninvasively predicting arrhythmia vulnerability in patients. Based on the close association between MTWA and arrhythmia mechanisms, as well as more than 100 years of clinical literature linking MTWA to arrhythmia susceptibility in patients, there is certainly considerable reason for enthusiasm for developing improved methods for measuring MTWA. However, recent efforts to develop so called time-domain methods for measuring MTWA, including the report by Sakaki et al, have yet to fulfill the basic standards applied to any diagnostic test introduced into clinical medicine. First, the scientific, clinical, or even theoretical rationale for the new test, such as TD-MTWA, must be apparent. Typically, when a new testing method is introduced, it is because it offers some fundamental advantage over existing methods of testing (i.e. the test offers greater sensitivity, reliability, speed, cost savings, etc). Since, the “gold standard” spectral method offers better sensitivity and selectivity for the MTWA signal, is no more costly, no more time consuming or computational intensive, and, importantly is unique in its capabilities for discriminating MTWA signal from important sources of artifact, the theoretical or practical justification for the time-domain or MMA method for measuring MTWA is unclear. Any rationale for time-domain MTWA measurement based on greater accessibility or ease of use of Holter recordings is not justified since the method of MTWA analysis is unrelated to the mode of ECG acquisition (i.e. exercise versus Holter). Some have suggested that the time-domain method might theoretically be less susceptible to nonstationarity of ECG data than spectral methods, but there is no empirical evidence to support this concern.

Second, any newly proposed diagnostic test requires careful standardization prior to its application in clinical trials, let alone clinical practice. While the time-domain method has been the subject of several previous studies, no clear standards for interpretation have emerged. It is clear that numerous critical factors such as selection of time intervals of analysis, accounting for major sources of ECG noise, accounting for physiological rate-dependency of MTWA, and the mode of data acquisition (Holter, exercise, recovery from exercise) have all been attempted without emergence of any clear standards of testing, or validation of reproducibility.

A final and equally important criterion for the validation of a new test is that once clear standards for test-positivity are established, the test must be applied prospectively to an independent and relevant patient population using pre-defined cutpoints

for test positivity. This, as well as the aforementioned steps required for validation, has yet to be applied to the time-domain method for MTWA measurement.