LETTERS TO THE EDITOR

Letter Regarding “Assessment of Physiological Amplitude, Duration and Magnitude of ECG T-Wave Alternans”

Raja J. Selvaraj, M.D.

From the Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, India

In their paper published in the October issue of this journal, Burattini et al. raise an interesting question, namely, is T-wave alternans (TWA) present at “physiological levels” in healthy subjects?¹ They set out to answer this question by using the adaptive match filter (AMF) method, previously described by them, to measure TWA in a group of healthy subjects.

The method essentially measures the amplitude of the signal derived by applying a band-pass filter with a narrow pass band around half the heart rate frequency to the electrocardiogram (ECG). Since some TWA was measurable in all the healthy subjects with this method, the authors conclude that a low level of TWA is a physiological phenomenon.

The attempt to establish a threshold for abnormal TWA measurement using the new method is welcome. However, the interpretation that physiological TWA is present in all healthy subjects is controversial. Similar to the more commonly used modified moving average (MMA) method, the AMF method suffers from an inability to control for the noise level in the ECG. The only noise control is in the identification and removal of noisy and non-sinus beats during preprocessing. The authors are correct in stating the respiratory signal is usually filtered out since it has a frequency outside the pass band, but it is known that sometimes harmonics of the respiratory frequency can overlap the alternans frequency when the heart rate is a multiple of the respiratory rate. The more important confounder is random noise in the ECG which is

usually white noise, that is noise containing all frequencies. The residual signal after filtering would contain the component of this noise in the pass band of the filter. Therefore, it is likely that the “physiological TWA” measured in healthy subjects is a measure of the random noise in the ECG. It must be noted that the MMA method also results in detection of some amount of TWA even in healthy subjects. It is essential to differentiate small magnitude TWA detected due to the inability of the method to correct for noise from real “physiological TWA.”

In an older paper describing the method,² the authors had stated that the reason behind establishing a threshold from measurements in healthy subjects was that “noise, artifacts and other cardiac variability may be detected as TWA episodes.” In order to understand the origin of the small magnitude TWA, I would suggest use of synthetic ECG waveforms with identical Q_RST complexes and added white noise. If the method is not affected by the presence of noise, it should result in a TWA measurement of zero.

REFERENCES

1. Burattini L, Zareba W, Burattini R. Assessment of physiological amplitude, duration and magnitude of ECG T-wave alternans. *Ann Noninv Electrocardiol* 2009;14:366–374.
2. Burattini L, Zareba W, Burattini R. Adaptive match filter based method for time versus amplitude characterization of microvolt ECG T-wave alternans. *Ann Biomed Engg* 2008;36:1558–1564.

Address for correspondence: Raja J. Selvaraj, M.D., 246, II Avenue, Banu Nagar, Ambattur, Chennai, India 600053. Fax: 91-413-2272067; E-mail: rajajs@gmail.com

No disclosures.