Independent and Complementary Utility of Ambulatory Electrocardiogram-Based T-Wave Alternans and Heart Rate Turbulence for Predicting Major Cardiac Events in Patients After Myocardial Infarction – Reply –

We cordially appreciate the remarks from Dr Verrier and Dr Schmidt on our recent study demonstrating the predictive capacity of T-wave alternans (TWA) based on the modified moving average method (MMA) and heart rate turbulence (HRT) using 24-hr Holter electrocardiogram (ECC) recordings in patients following myocardial infarction (MI). Herein, we reply to the 2 questions they raised.

First we address the question on the timing of ECG monitoring following MI to stratify the risk of cardiac events using TWA. Exner et al stated that TWA measurements should be performed at 10–14 weeks after MI. Other investigators found significant value in TWA monitoring for risk stratification at ≤15 days after MI. Those studies support the idea that earlier TWA measurement is better than later measurement for predicting future cardiac events in post-MI patients.

In our study, we measured TWA in the stable phase of MI. Although the precise period could not be determined, the measurement was performed at least >2 weeks after the onset, including some of remote phase of MI; this was not mentioned in our article. Both TWA and HRT values are significant for predicting overall cardiac mortality and fatal arrhythmic events. Our study showed that later TWA measurements are useful for later measurement for predicting future cardiac events in post-MI patients. We believe that electrocardiographic markers should be assessed when the substrates of myocardium are stable (ie, the healing stage after MI) because the wave morphology on ECC, including that of T waves, changes dynamically in the early phase of MI and pharmacological therapy such as β-blocker treatment is generally administered in this phase. It has been shown that the intervention of medical therapy affects the outcome of TWA assessment. Therefore, we believe that the later phase of MI (ie, not during the recovery phase of acute MI) is better than the earlier phase for TWA measurements in post-MI patients. Tapanainen et al reported that TWA (spectral TWA, not MMA-TWA) values measured within 2 weeks after acute MI are not useful in the determination of the risk of mortality.

The best time for TWA measurement may relate to the degree of cardiac function after MI. In our study, the majority of the study population had preserved cardiac function (mean left ventricular function [LVEF] 47%) after MI. Other studies that support early TWA measurement had study populations with relatively low LVEF (≤40%). When patients have preserved cardiac function after MI, the later phase >2 weeks (ie, not during the recovery phase of acute MI) appears to be more appropriate than the early phase for TWA measurement.

The second question was regarding on the utility of TWA and HRT in guiding medical and device therapies. Studies have shown that these markers can serve as therapeutic markers in medical therapy. In addition, the findings of previous clinical studies suggest that the magnitude of both TWA and HRT reflects the effects of pharmacological therapy without reducing their predictive capacity. We believe that both markers can be used as therapeutic markers for medical therapy, particularly β-blocker treatment. In terms of guiding device-based therapy, the utility of both markers is still unknown. However, it is being evaluated in an ongoing clinical trial, REFINE ICD (Risk Estimation Following Infarction Noninvasive Evaluation – Implantable Cardioverter Defibrillator efficacy). We will know the outcomes of this study in the near future.

An attractive option is to use TWA and HRT measurements to track post-MI rehabilitation, which can improve baroreceptor sensitivity with long-term benefits, potentially through favorable remodeling of the heart. We believe that the combination of TWA and HRT can guide cardiac rehabilitation during post-MI recovery. However, to support our idea, further evaluations are required.

References


Kyoko Hoshida, MD
Yosuke Miwa, MD
Mutsumi Miyakoshi, MD
Takehiro Tsukada, MD
Satoru Yusu, MD
Hideaki Yoshino, MD
Second Department of Internal Medicine, Kyorin University School of Medicine, Tokyo, Japan
Takanori Ikeda, MD
Department of Cardiovascular Medicine, Toho University Faculty of Medicine, Tokyo, Japan

(Released online January 9, 2013)