Spontaneous Ventricular Tachycardia and Fibrillation in a Patient with a Positive Microvolt T Wave Alternans Test and Negative Electrophysiological Study

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MOLON, G., ET AL.: Spontaneous Ventricular Tachycardia and Fibrillation in a Patient with a Positive Microvolt T Wave Alternans Test and Negative Electrophysiological Study. This report describes a patient with a previous myocardial infarction who presented with syncope. The patient had a positive microvolt T wave alternans test, a negative electrophysiological study, and a normal heart rate variability. In hospital, the patient had episodes of ventricular tachycardia and fibrillation. An implantable cardioverter defibrillator was implanted and during the following week it discharged appropriately. (PACE 2004; 27:1–3)

T wave alternans, electrophysiological study, cardiac arrhythmias, implantable cardioverter defibrillator

Introduction

T wave alternans (TWA) is a change in morphology of the T wave on an every other beat basis. Visual TWA has been observed at the onset of ventricular tachycardia (VT) and/or ventricular fibrillation (VF). Microvolt TWA cannot be seen but it can be detected by the spectral method and the use of high resolution electrodes. Several clinical studies have been published that used atrial pacing to increase heart rate (HR), where TWA had a sensitivity of 89% and specificity of 89% in predicting ventricular tachyarrhythmic events. The predictive value of TWA was confirmed in other studies with TWA measured during exercise stress. One multicenter study demonstrated that TWA, when compared with programmed ventricular stimulation during electrophysiological study, had an equivalent positive predictive accuracy but a better negative predictive accuracy. In another study performed in patients with implanted cardioverter defibrillators (ICDs), TWA was predictive of appropriate ICD discharge but electrophysiological study was not. A new multicenter clinical study (ABCD) is now underway to evaluate if TWA alone is a sufficient indication for the implantation of ICDs in coronary artery disease patients with left ventricular dysfunction and nonsustained VT.

Case History

This report describes the case of a 71-year-old man with previous myocardial infarction, syncope, positive TWA, and negative electrophysiological study. The echocardiogram showed a left ventricular ejection fraction of 0.40 and moderate aortic stenosis. The resting electrocardiogram (ECG) and physical examination revealed no changes from prior examinations, particularly no evidence of ischemia. A 24-hour Holter recording revealed polymorphic ventricular premature beats (VPBs) and asymptomatic episodes of monomorphic nonsustained VT (NSVT). The R-R interval variability (SDNN measure 158.1 ms) was within normal limits and the QT interval (454 ms at 64 beats/min) was a borderline value. After admission to the hospital, the patient underwent TWA and electrophysiological testing to evaluate the risk of VT and VF.

TWA Test

The patient underwent TWA testing using the HearTwave system (Cambridge Heart, Inc., Bedford, MA, USA) during atrial pacing. Atrial pacing at 109 beats/min did not result in a consistent 1:1 atrioventricular (AV) conduction so the pacing rate was reduced to 101 beats/min. The Cambridge Heart analysis is used to report TWA results (Fig. 1). The initial 4 minutes of data is uninterpretable due to an excessive level of ectopy (percent of bad beats trend grayed in). The next 8.5 minutes of data are uninterpretable due to intermittent 2:1 AV conduction block from minute. Starting at 12:30 minutes, sustained TWA meeting voltage (≥1.9 µV) and alternans ratio (indicated by graying in of voltage trace) is seen in vector magnitude lead VM and vector lead Z (also seen in leads V1, V2, not shown). Presence of sustained TWA with an onset HR of 110 beats/min indicates a positive study.