

## Idiopathic Ventricular Tachycardia with a Left Bundle Branch Block Morphology and Right Axis Deviation

Bernard Belhassen MD<sup>1</sup>, Aharon Glick MD<sup>1</sup>, Itzhak Herz MD<sup>1</sup>, Michael Berger MD<sup>1</sup> and Moshe Swissa MD<sup>2</sup>

Departments of Cardiology, <sup>1</sup>Tel Aviv Sourasky Medical Center, Tel Aviv, and <sup>2</sup>Kaplan Medical Center, Rehovot, Israel

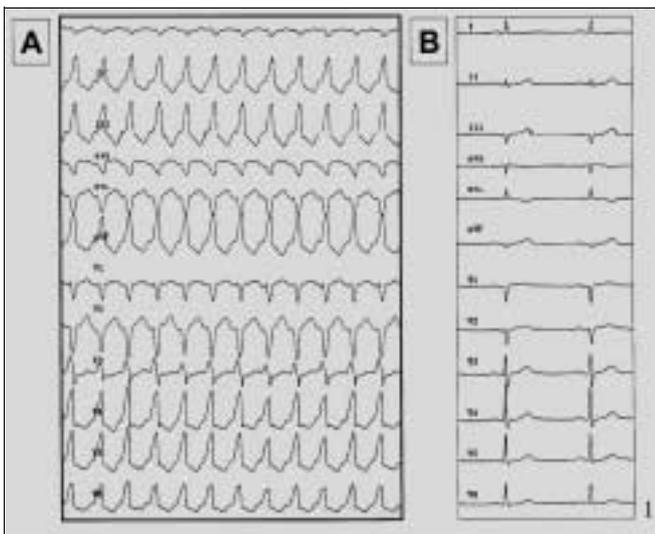
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Idiopathic ventricular tachycardia, having a morphology of left bundle branch block and right axis deviation, is believed to originate in the right ventricular outflow tract. The present observation demonstrates an unusual origin of such a tachycardia.

This 68 year old man suffered from recurrent, symptomatic episodes of drug-refractory sustained VT for the last 6 months. All VT episodes required direct current shock for termination. The VT had a morphology of LBBB and right axis deviation and a rate of 150/min [Figure 1A]. The patient had no previous cardiac history. His baseline electrocardiogram [Figure 1B] and echocardiogram were normal. A symptom-limited exercise test did not show ECG signs of myocardial ischemia or ventricular arrhythmias. A diagnosis of RVOT tachycardia was made and a radiofrequency ablation procedure was performed at another hospital. Multiple radiofrequency pulses delivered in the RVOT failed to affect VT.

VT = ventricular tachycardia  
LBBB = left bundle branch block  
RVOT = right ventricular outflow tract



**Figure 1.** Twelve lead ECG tracings during ventricular tachycardia [A] and sinus rhythm [B].

The patient was referred to our department due to aggravation in frequency of episodes of VT (three episodes within a week). During electrophysiologic study, sustained VT similar to the spontaneous tachycardia was easily induced with programmed ventricular stimulation. We first considered the possibility of repeating radiofrequency ablation, employing the same approach used during the first ablation procedure. However, a subtle ECG detail during VT let us believe that VT might not originate in the RVOT. Actually, the QRS transition in precordial leads was noted in lead V3 [Figure 1A]. Previous studies showed that successful ablation of VT in the RVOT was associated in most patients with a QRS transition in V4-V5 and very rarely in V3 [1,2]. In addition, recent reports showed that up to 18% of idiopathic VT with a LBBB and right axis deviation pattern originate either in the left ventricular outflow tract or in a coronary cusp [3-6], and this is not an uncommon reason for failure of ablation of VT supposedly originating in the RVOT [6]. Such tachycardias have been found to invariably exhibit a transitional zone in V1-V3 (3-6).

Based on these data, we decided to begin mapping VT from the left side after performing coronary angiography. The latter showed an isolated 80% distal stenosis of the right coronary artery. Left ventriculography was normal. The lack of segmental wall abnormalities suggested no relationship between the episodes of VT and the coronary artery stenosis, leading us to assume that VT actually had an idiopathic origin.

Extensive mapping showed that the earliest electrical activity during VT was located at the right coronary cusp about 1.5 cm from the ostium of the right coronary artery [Figure 2], 50 msec before the QRS onset [Figure 3]. A radiofrequency pulse (55 degrees, 70 watts, 60 seconds) administered at this site terminated VT after 5 seconds. A delayed potential was recorded during sinus rhythm at the ablation site. Pacing at this site required high stimulus current intensity (8 mA) and resulted in QRS morphology identical to that present during VT, with conduction disturbances of the Wenckebach type between the stimulus and the QRS complex. Multiple attempts to re-induce VT with programmed ventricular stimulation failed, suggesting a successful ablation procedure. No complications were observed. The patient has remained arrhythmia-free during a follow-up of 5 months.



**Figure 2.** Location of the ablation catheter in the right coronary cusp in various X-ray views (LAO = left anterior oblique, AP = anteroposterior, RAO = right anterior oblique). The ablation catheter is indicated by an arrow from low to high. The arrow from high to low indicates the electrode catheter placed in the anteroseptal area of the right ventricular outflow tract. The horizontal arrow indicates an additional angiographic catheter introduced in the right coronary artery for safety reasons.

**Comments**

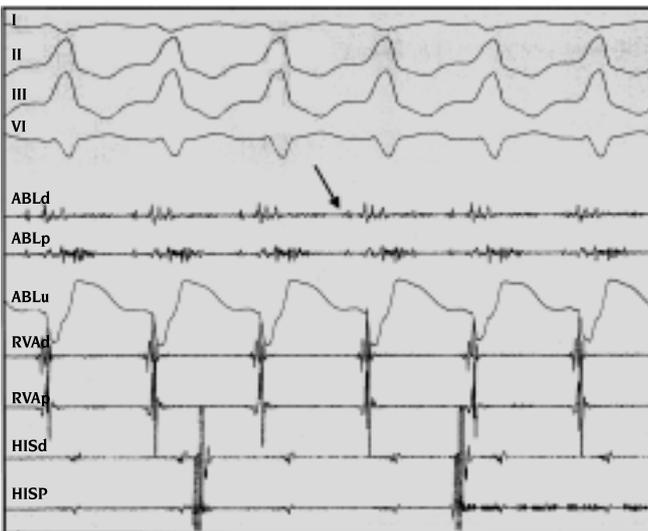
- Anatomically, the aortic root occupies a central location within the heart, with the left and right coronary aortic sinuses adjacent to the left and right atrial appendages, respectively. The anteriorly situated RVOT passes slightly superior to and leftward of the aortic valve. The complex spatial relationships between the RVOT and the aortic sinus cusps may explain the similar ECG characteristics of VT originating from these areas [6].
- VT may originate in a coronary cusp, a zone that is usually considered as electrically silent.
- An idiopathic VT with a LBBB morphology does not always originate in the right ventricle.
- A transition of QRS in right precordial leads (V1-V3) during VT

should raise the possibility that VT originates in the left ventricular outflow tract or a coronary cusp.

- Although radiofrequency ablation in a coronary cusp is usually safe, as in our patient, it may carry potential for serious complications, including damage to coronary arteries [7].
- Meticulous care should prevail in correctly positioning precordial lead electrodes, since any error may hamper the correct diagnosis and a precise ECG may influence the approach to successful ablation.

**References**

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**Figure 3.** Mapping of ventricular tachycardia. The ablation catheter (Abl d) is placed in the right coronary cusp where it records the earliest activation during ventricular tachycardia. Note the atrioventricular dissociation on the His bundle lead (HBE). Also note that the activation in the anteroseptal area of the right ventricular outflow tract (RVA) is less early than that at the right coronary cusp.

**Correspondence:** Dr. B. Belhassen, Cardiac Electrophysiology Laboratory, Dept. of Cardiology, Tel Aviv Sourasky Medical Center, 6 Weizmann Street, Tel Aviv 64239, Israel.  
email: bblhass@tasmc.health.gov.il