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ECG TEACHING COMPETITION

ADVANCED

IMAGING VIGNETTE: ECG CHALLENGE

Now You See It....

When Lead Positions Tell 2 Stories

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ABSTRACT

The field of heart transplantation has seen considerable innovation over the years. Understanding the wide range of presentations in patients who have undergone operations we now consider historical remains important. This case illustrates the complexities of management in a patient with a previous heart transplant who presented with ventricular tachycardia. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2021;3:1398–1399) © 2021 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

CASE

A 73-year-old gentleman with a history of heart transplantation 30 years previously presented with several weeks of dyspnea and fatigue. His background included a heart transplant for ischemic cardiomyopathy 30 years ago and a non-ST-segment elevation myocardial infarction 3 years previously. The electrocardiogram (ECG) revealed a broad complex tachycardia, although the patient was hemodynamically stable with a blood pressure of 129/67mm Hg. He was well and was not aware of any palpitations.

WHICH IS THE DIAGNOSIS?

What is seen in this ECG (**Figure 1**)?

A. Artefact trace with underlying normal sinus rhythm
B. Ventricular tachycardia (VT)
C. Dual rhythms—simultaneous ventricular tachycardia and sinus rhythm
D. Supraventricular tachycardia with aberrancy

The correct answer is C.

EXPLANATION

Artefact can sometimes mimic a ventricular rhythm (the so-called “toothbrush sign”), but in this case, the ECG was taken in a patient at rest without an obvious explanation for artefact. If we look at lead I, we clearly see regular, narrow QRS complexes, but at the same time, V_4-V_6 look like classical VT. The explanation here was unusual in that the patient had both sinus rhythm and VT simultaneously (Supplemental Figures 1C and 1D).

This patient has had a heterotopic heart transplant, and his native heart is in VT at a rate of 170 beats/min, whereas the donor heart remains in sinus rhythm, as seen in lead II at a rate of 107 beats/min

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ABBREVIATIONS AND ACRONYMS

ECG = electrocardiogram

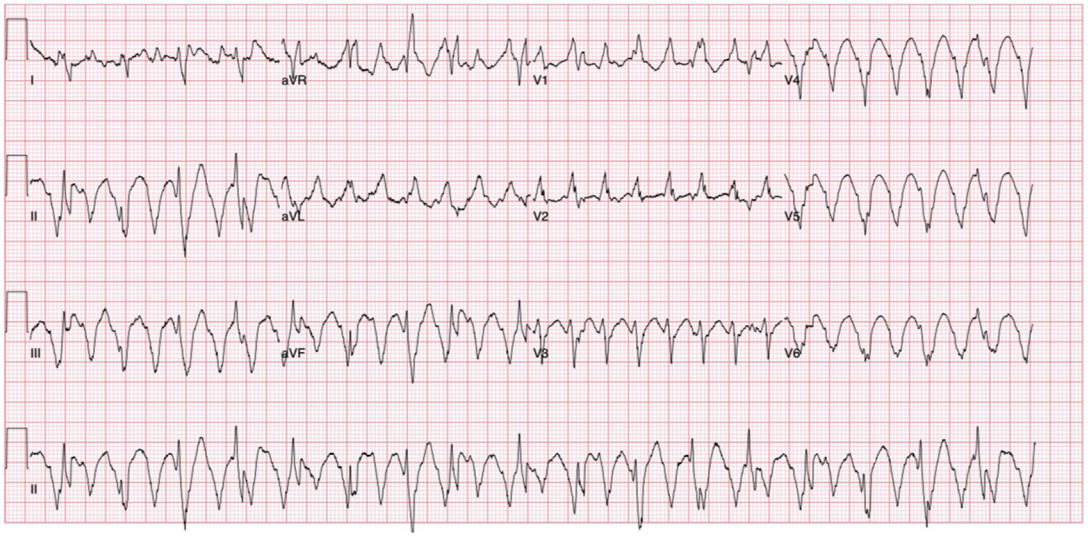
VT = ventricular tachycardia

(Supplemental Figure 1F). The superior axis (negative in II, III, and aVF) and right bundle branch block appearance of the VT imply a left ventricular origin (1).

Heterotopic heart transplants are performed by connecting the atria (Supplemental Figure 1A) and grafting the aortas and pulmonary arteries together to give biventricular function (Supplemental Figure 1B). The first heterotopic heart transplant, performed in 1974, was originally thought advantageous during the period prior to the development of antirejection medications, and can be advantageous in patients with elevated pulmonary pressures; it is rarely used in the modern era (2). The risk here is of thrombosis within the poorly functioning native heart, whose output has been further reduced by VT. A transesophageal echocardiogram was performed to exclude native heart thrombus. This revealed severe left ventricular dysfunction of the native heart with preserved function in the donor heart but no clot.

Following this, a direct current cardioversion was performed. The defibrillator leads were placed so as to synchronize with the donor heart, thus limiting the risk of an R on T phenomenon in the donor heart (Supplemental Figure 1D). This involved placing the defibrillator ECG leads at a +150° axis to correspond with the maximum R-wave of the donor heart (Supplemental Figure 1E). The defibrillator pads were then placed as shown in Supplemental Figure 1E to cardiovert the native heart. One 200-J shock was successful in restoring sinus rhythm in the native heart (Supplemental Figure 1G). Both of the patient's hearts remained in sinus rhythm, and he was subsequently discharged on amiodarone the following day.

FIGURE 1 Electrocardiographic Trace of Patient With Heterotopic Heart Transplant Depicting Ventricular Tachycardia in the Native Heart and Sinus Rhythm in the Donor Heart



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KEY WORDS arrhythmia, ECG, heterotopic heart transplant, ventricular tachycardia

APPENDIX For a supplemental figure, please see the online version of this paper.