Nonischemic Ventricular Tachycardia

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KEYWORDS

• Ventricular tachycardia • Nonischemic cardiomyopathy • Entrainment • Electroanatomic mapping

KEY POINTS

- Nonischemic cardiomyopathies may have a mid-myocardial or epicardial substrate.
- A unipolar endocardial voltage map may indicate the presence of epicardial scar.
- If no endocardial isthmus sites exist when mapping ventricular tachycardia, consider a mid-myocardial or epicardial isthmus.
- Repeat ablation is sometimes needed for patients with multiple complex ventricular tachycardias.

CLINICAL HISTORY

A 49-year-old man with long-standing left ventricular (LV) nonischemic cardiomyopathy (NICM), in the setting of remote alcohol and stimulant drug abuse, presented with recurrent ventricular tachycardia (VT) and implantable converter-defibrillator (ICD) shocks. His baseline LV ejection fraction was 40% to 45% and his functional status was New York Heart Association Class 1. He underwent implantation of a primary prevention cardiac resynchronization therapy defibrillator (CRTD) (Renewal H210; Boston Scientific, Natick, MA) 4 years prior. His first occurrence of VT was 12 months before his current procedure.

The patient had undergone multiple prior attempts at VT mapping and ablation, including epicardial mapping and ablation. Despite termination of VT with ablation during prior procedures and extensive substrate-based ablation through regions of myocardial scar with pace maps matching the clinical VT morphologies, he continued to experience ICD shocks. He presented with recurrent VT and ICD shocks despite medical therapy with sotalol.

CLINICAL COURSE

He presented to the emergency room after experiencing several ICD shocks; the presenting electrocardiogram (ECG) revealed a VT at a cycle length of 490 milliseconds, matching his prior dominant clinical VT. At electrophysiologic study, the clinical VT was induced with catheter manipulation.

Question 1: Based on the morphology of the VT in **Fig. 1**, what is the most likely exit site?

The VT has a right bundle branch block (RBBB) morphology with a right inferior axis. There is precordial concordance which, in combination with the limb lead axis, places the exit site at the basal superolateral LV wall (Josephson site 10). There is an rS pattern in leads I and AVL, which argues against an epicardial exit because of the absence of a q wave.[1,2] Interval criteria (intrinsicoid deflection in V2 = 71 milliseconds, pseudo-delta 16 milliseconds, maximum deflection index

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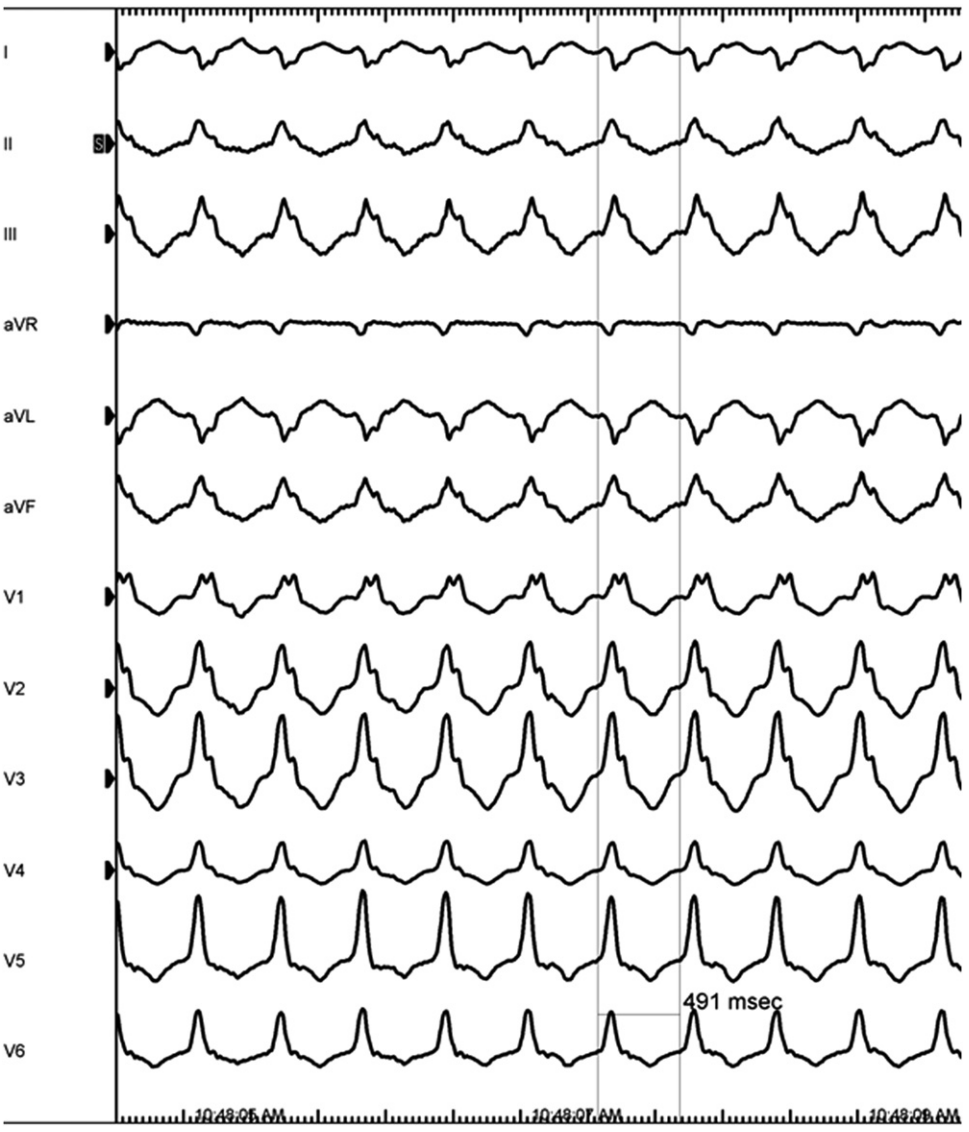

Fig. 1. Clinical VT reinduced in the laboratory.

60 milliseconds/176 milliseconds = 0.34) also favor an endocardial exit site.

Electroanatomic mapping of the LV endocardium revealed extensive basal inferior and lateral bipolar scar (**Fig. 2**A). Note that the bipolar endocardial scar does not extend to the superolateral basal left ventricle, the purported exit site of the clinical VT. The unipolar endocardial voltage map (**Fig. 2**B) shows more extensive abnormality suggestive of a mid-myocardial or epicardial scar. The earliest endocardial diastolic activity during VT was mapped to Josephson site 10. Entrainment at this site is shown in **Fig. 3**.

Question 2: How would you characterize this entrainment site?

Entrainment confirms that the LV endocardial site is an exit site for the VT (entrainment with concealed fusion, postpacing interval ≈ tachycardia cycle length [TCL], stimulus-QRS <30% VT cycle length). Further endocardial entrainment mapping