A 50-year-old man with idiopathic premature ventricular contractions (PVCs; PVC 1, Figure 1A) and ventricular tachycardias (VTs) was referred for catheter ablation. Activation and pace mapping were performed at multiple sites in the right and left ventricular outflow tracts (RVOT and LVOT) (Figure 1). Nonirrigated radiofrequency (RF) applications delivered in the left coronary cusp where pacing reproduced a perfect pace map failed to suppress PVCs but gave a slight change in the QRS morphology of the PVCs characterized by S waves in lead V6 (PVC 2, Figure 1B). VT with this altered QRS morphology was induced by programmed stimulation (VT 1, Figure 1B). Pacing in the distal great cardiac vein (GCV) reproduced a different QRS morphology (Figure 1D). During PVC 2, the earliest ventricular activation was observed at the aorto-mitral continuity (AMC) where pacing reproduced a perfect pace map (Figure 1B). However, nonirrigated RF applications at this site did not prevent the induction of multiple morphologies of VT with programmed stimulation (Figure 1). Those VT morphologies exhibited a fair match to the pace maps from the RVOT, GCV, and right coronary cusp (RCC) (VT 2, Figure 1C; VT 3, Figure 1D; and VT 4, Figure 1E, respectively). Gradual transition between 2 of those VT morphologies (VT 3 and VT 4) was observed, and the local ventricular activation in the GCV preceded the QRS onset during both of those VTs (Figure 2). The local ventricular activation in the GCV relative to that in the His bundle region was 35 ms earlier during VT 3 than VT 4 (Figure 2). Because RF applications in the GCV were limited by high impedance, epicardial mapping via a subxiphoid access was performed. However, no epicardial ventricular activation as early as in the GCV could be recorded. Very detailed endocardial and epicardial activation mapping of both the RVOT and LVOT during the multiple morphologies of VT revealed a consistently early activation in the AMC but variable activation times at remote sites. Finally, RF applications delivered to the medial AMC with an irrigated ablation catheter eliminated all the ventricular arrhythmias (VAs) (Figure 3).

In this case, a single intramural origin with a preferential conduction to multiple exit sites all over the RVOT and

Figure 1. Twelve-lead electrocardiograms of VTs, PVCs, and pace maps (PMs), and a 3-dimensional computed tomography image showing the presumed ventricular arrhythmia origin (star), preferential conduction (dotted arrows), and exits identified by pace mapping. Ao indicates aorta; GCV, great cardiac vein; LA, left atrium; LCC, left coronary cusp; LV, left ventricle; RCC, right coronary cusp; and RVOT, right ventricular outflow tract.
LVOT might have exhibited multiple VAs. No anatomic specificities other than an intramural origin were suggested because the QRS morphologies of all the VAs and their relevant pace maps were consistent with those of previous reports. Although all the exits were located in close proximity, the directions from the origin varied between rightward and leftward and between endocardial and epicardial. This case suggests that preferential conduction to multiple exits may occur anywhere in the LVOT. That property of preferential conduction in the LVOT may cause VAs with LVOT origins to exhibit variable ECG features and limit the accuracy of ECG algorithms to predict the site of a VA origin.

Disclosures
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References
Figure 3. Successful ablation site. ABL indicates ablation catheter; LAO, left anterior oblique view; RAO, right anterior oblique view; RV, right ventricular catheter; and V-QRS, the local ventricular activation time relative to the QRS onset. The other abbreviations are as in the previous figures.
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