The V6R/V5R index, a novel ECG criterion, can identify idiopathic ventricular arrhythmias arising from the aortic cusp


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Background: Idiopathic ventricular arrhythmias (VAs) with a left ventricular outflow tract (LVOT) origin often have dominant R waves (R wave amplitude > S wave amplitude) in the precordial leads (V1 through V6). Radiofrequency catheter ablation (RFCA) within the aortic cusp can eliminate LVOT-VAs. However, some require RFCA at the aorto-mitral continuity (AMC), the endocardium just below the LV summit, and/or mitral annulus for a cure. No ECG indices have been fully established to help differentiate between VAs that can be ablated from the aortic cusp and those that require ablation from other sites.

Purpose: The purpose of this study was to identify ECG indices useful in differentiating VAs with an aortic cusp origin from those from outside the cusp among the LVOT-VAs.

Methods: Among 200 patients in whom successful RFCA of idiopathic VAs was obtained at the OT, this study included 36 (totaling 37 premature ventricular complexes [PVCs]) who had dominant R waves in the precordial leads and an LVOT origin. According to the PVC origins, the PVCs were classified into 2 groups: 1) Cusp group (n=22); PVCs were successfully eliminated by RFCA within or just under the aortic cusp and 2) non-cusp group (n=15); PVCs were successfully ablated from the other LVOT sites described above or by a sequential unipolar ablation (combination of the cusp, AMC, and mitral annulus). The detailed PVC morphology was compared between the 2 groups.

Results: There was no significant difference in the ratio of the Q wave amplitude in aVL to aVR, V2 R/S amplitude ratio, V2 R/S duration index, V2 transition ratio, transition zone index, or V2S/V3R index between the 2 groups. However, the ratio of the R wave amplitude in V6 to V4 (V6R/V4R index) was significantly higher in the cusp group than in the non-cusp group (0.68±0.14 mV vs. 0.52±0.15 mV, p=0.002). The receiver operating characteristic curve demonstrated that a V6R/V4R index of >0.56 predicted the PVCs originated from the cusp with a sensitivity of 0.73 and specificity of 0.91 (area under the curve of 0.81).

Conclusion: The V6R/V4R index is a simple and useful ECG parameter and could distinguish PVCs with an aortic cusp origin from those originating from outside the cusp among the LVOT-VAs with a high accuracy.