Discrete prepotentials with an isoelectric segment at the successful ablation site in the right ventricular outflow tract and pulmonary artery junction in a case with a ventricular arrhythmia

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Introduction

A discrete prepotential with an isoelectric segment could be recorded at the successful ablation site in patients with outflow tract ventricular arrhythmias (OT-VAs). A prior report showed that the site of a discrete prepotential with an activation time of ≥50 milliseconds in the coronary cusps may indicate a successful ablation site of an OT-VA. However, the observation of such discrete prepotentials at the successful ablation site of an OT-VA has never been reported outside the coronary cusps. We describe a case with an OT-VA wherein a discrete prepotential with an isoelectric segment was constantly recorded at the successful ablation site at the junction between the right ventricular outflow tract (RVOT) and pulmonary artery (PA) but not in the coronary cusps.

Case report

A 78-year-old woman was admitted for catheter ablation of artery; PVC artery (PA) but not in the coronary cusps. We describe a case with an OT-VA wherein a discrete prepotential with an isoelectric segment was constantly recorded at the successful ablation site in patients with outflow tract ventricular arrhythmias (OT-VAs). A prior report showed that the site of a discrete prepotential with an activation time of ≥50 milliseconds in the coronary cusps may indicate a successful ablation site of an OT-VA. However, the observation of such discrete prepotentials at the successful ablation site of an OT-VA has never been reported outside the coronary cusps. We describe a case with an OT-VA wherein a discrete prepotential with an isoelectric segment was constantly recorded at the successful ablation site in patients with outflow tract ventricular arrhythmias (OT-VAs). A prior report showed that discrete prepotentials could be an indicator of ventricular myocardial extensions extend into the PA and aorta beyond the semilunar valves. A recent report showed that discrete prepotentials could be an indicator of the presence of ventricular myocardial extensions.

Keywords

Ventricular arrhythmia; Prepotential; Catheter ablation; Coronary cusp; Right ventricular outflow; Premature ventricular contraction

Abbreviations

NSVT = nonsustained ventricular tachycardia; OT-VAs = outflow tract ventricular arrhythmias; PA = pulmonary artery; PVC = premature ventricular contraction; RF = radiofrequency; RVOT = right ventricular outflow tract

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of a successful ablation site for VAs originating from the coronary cusps.\textsuperscript{1} The origin of the discrete prepotentials is not known; however, a dead-end tract at the top of the ventricular septum is speculated to be the origin of the potential.

In the present case, the V2 transition ratio suggested that the origin of the PVC was the aortic cusps. We performed high-density mapping of the coronary cusps using a multispline catheter in addition to a conventional catheter because detailed mapping was required to identify the tiny prepotentials inside the cusps. This 20-pole steerable mapping catheter with 5 soft radiating spines (1-mm electrodes, 2-6-2-mm interelectrode spacing) enabled acquiring a high signal resolution, from multiple points simultaneously, and high-density mapping. Interestingly, no prepotentials were observed in the coronary cusps even at a site close to the successful site at the RVOT-PA junction where the discrete prepotentials were recorded. Pace mapping at a site where a discrete potential was observed generated almost identical surface QRS complexes as the clinical VAs with latency. The stimulus–QRS complex latency could be explained by the tract from the arrhythmogenic origin being captured and exited, and then depolarizing the myocardium with a conduction delay. The RVOT and coronary cusps are close to each other, and it seems likely that the dead-end tract was closer to the RVOT-PA junction than the left coronary cusp in this case. It is possible that the fractionated potentials overlapping with the QRS complex during sinus beats prior to the RF application might have reflected the activation of the dead-end tract, and the discrete prepotentials might have represented the activation of a tract connecting the arrhythmia focus to the ventricular myocardium, as with VAs originating from the aortic cusps. Valve-closure artifact seems to be unlikely because (1) the interval between the prepotential and PVC was always constant, whereas the interval between the preceding QRS complex of the sinus beat and the prepotential was not constant, and (2) a similar potential was never recorded during sinus rhythm after the successful RF delivery at the same spot.

**Figure 1** Activation and pace mapping and fluoroscopic images of the catheter position at the left coronary cusp adjacent to the ostium of the left coronary artery. The earliest activation preceded the QRS onset by 24 milliseconds, and nearly perfect pace mapping (11/12) was obtained. ABL = mapping catheter; RVA = right ventricular apex; uni = unipolar; bi = bipolar; RAO = right anterior oblique view; LAO = left anterior oblique view.

**KEY TEACHING POINTS**

- The V2 transition ratio is useful for localizing the arrhythmia focus, but it is not 100% specific nor is it as sensitive as the other criteria for determining the location of ventricular arrhythmias.
- Ventricular myocardial extensions extend into the pulmonary artery and aorta beyond the semilunar valves.
- Discrete prepotentials can be obtained not only in the coronary cusps, but also in the right ventricular outflow and pulmonary artery in patients with outflow tract ventricular arrhythmias.
Figure 2  Activation and pace mapping and fluoroscopic images of the catheter position at the successful ablation site at the right ventricular outflow tract-PA junction. The discrete prepotential preceded the QRS onset by 110 milliseconds, with a 63-millisecond isoelectric segment. Pace mapping with a stimulus–QRS interval of 48 milliseconds was excellent when pacing was delivered at the same site at which the discrete prepotential was recorded.

Figure 3  A: The discrete prepotential constantly preceded the QRS onset of the PVCs at the successful ablation site at the right ventricular outflow tract–pulmonary artery junction. B: After a 5.3-second radiofrequency (RF) application at that site, the ventricular arrhythmias were no longer observed. C: The fractionated potentials fused with the QRS complex during the sinus beats prior to the application disappeared just after the successful application.
Although OT-VA patients with discrete great arterial potentials have been reported, a distinct discrete isoelectric segment between the discrete prepotentials and ventricular electrograms as in this case has never previously been recognized except for on the coronary cusps. The V2 transition ratio is useful for localizing the arrhythmia focus, whereas is not 100% specific and as sensitive as the other criteria for determining the location of VAs. To the best of our knowledge, this is the first OT-VA case in whom clear discrete prepotentials with an isoelectric segment were recorded at the successful ablation site outside the coronary cusps.

**Conclusion**

This case highlights that discrete prepotentials could be obtained not only in the coronary cusps, but also in the RVOT and PA in OT-VA patients.

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