Case Report

3D Electroanatomic Mapping of an Extreme Oblique Accessory Pathway in Wolff-Parkinson-White Syndrome

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A high-risk left-sided posterolateral manifest accessory pathway (AP) was identified in a 49-year-old man. Two prior ablations had failed. A repeat procedure using 3D electroanatomic mapping demonstrated an extremely oblique AP. The earliest atrial activation site was not amenable to endocardial ablation. The earliest ventricular activation site was identified, demonstrating an AP with an extremely slanted course. Radiofrequency ablation here resulted in sustained bidirectional AP block. In challenging AP ablation cases, recognition of the potential for an oblique AP and the use of electroanatomic mapping may be beneficial.

RÉSUMÉ

Une voie accessoire (VA) apparente postéro-latérale gauche à haut risque a été identifiée chez un homme de 49 ans. Deux ablations antérieures avaient échoué. Une procédure répétée utilisant la cartographie électroanatomique 3D a révélé une VA extrêmement oblique. Le site ayant l'activation auriculaire la plus précoce ne se prêtait pas à une ablation endocardique. Le site ayant l'activation ventriculaire la plus précoce a été identifié, montrant une VA avec une trajectoire extrêmement inclinée. L'ablation par radiofréquence a ici entraîné un bloc bidirectionnel soutenu de la VA. Dans les cas difficiles d'ablation de VA, la reconnaissance du potentiel d'une VA oblique et l'utilisation de la cartographie électroanatomique peuvent être bénéfiques.

A 49-year-old man with a bicuspid aortic valve and recurrent supraventricular tachycardia in the context of Wolff-Parkinson-White (WPW) syndrome presented to our centre following successful resuscitation of out-of-hospital cardiac arrest. WPW ablation previously attempted at another centre had been unsuccessful. His baseline 12-lead electrocardiogram (ECG; Fig. 1A) revealed left-sided posterolateral manifest pre-excitation. Echocardiography demonstrated a normal ejection fraction, and cardiac magnetic resonance imaging revealed a structurally normal heart with no evidence of scar. An electrophysiology study confirmed a high-risk manifest accessory pathway (AP) with an effective refractory period of < 500/200 msec; earliest atrial activation was noted to be at the left anterolateral region. Despite the lack of success with endocardial ablation of the AP at the site of earliest atrial activation when performed at the previous

institution, this procedure was attempted again with no success. An attempt to ablate the earliest atrial activation site within the coronary sinus was also unsuccessful. Both endocardial ablation attempts were performed via a trans-septal approach using irrigated radiofrequency ablation.

As a result, a repeat procedure was performed at our institution using the Ensite Precision 3D electroanatomic mapping system (EAM; Abbott, St Paul, MN), which demonstrated an extremely oblique AP (Fig. 2). The earliest atrial activation site during ventricular pacing was identified anterolaterally within the coronary sinus, at the 2 o'clock position of the mitral annulus (Fig. 2A). This site was not readily accessible by ablation within the left-atrium endocardium, thus explaining the lack of success of the previous ablations at the atrial activation site. The ventricular activation site was identified posterolaterally at the 5 o'clock position of the mitral annulus (Fig. 2B). Radiofrequency ablation using an irrigated, contact-force catheter (30W, 43 °C, target force-time integral = 400 g sec, 17 cc/min irrigation) at this site resulted in bidirectional block of the AP with no further recurrence of AP conduction. A post-procedure 12-lead ECG also demonstrated the absence of pre-excitation (Fig. 1B).

Discussion

The baseline ECG in this case was suggestive of a left-sided posterolateral AP, which corresponded to localization of the

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Ethics Statement: The anonymized case report is submitted in accordance with the standards of the University of Manitoba Biomedical Research Ethics Board.

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See page 700 for disclosure information.

Novel Teaching Points

- AP localization may differ, depending on atrial insertion vs ventricular insertion sites.
- Careful mapping of both atrial and ventricular insertion sites is imperative when performing challenging AP ablations.
- The use of EAM may be beneficial during challenging, high-risk AP ablations.

ventricular activation site during the electrophysiology study. Due to the slanted course of the AP, the atrial insertion was localized to the anterolateral region. Previous ablation attempts had relied on conventional mapping and ablation of the atrial insertion within the endocardium and were therefore unsuccessful given the epicardial location of the atrial insertion. When this approach was unsuccessful, attempts at ablating the ventricular insertion in the same region as the atrial insertion were therefore also unsuccessful due to the oblique course of the AP.

There are numerous reasons that ablation of an AP may be unsuccessful.¹ Common reasons include the inability to position the ablation catheter at the correct target site, mapping error due to an oblique course of the AP (in relation to the atrioventricular groove), and an epicardial location (eg, coronary sinus) of the AP.^{1–3} As demonstrated in this case, a combination of factors resulted in multiple

unsuccessful ablations of a high-risk accessory pathway—an epicardial atrial insertion site and an extremely slanted AP resulting in a distantly located ventricular insertion site. Awareness of potential barriers to successful AP ablation, careful mapping of both atrial and ventricular insertion sites, and the use of EAM may be beneficial when confronted with challenging AP ablations.

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Disclosures

The authors have no conflicts of interest to disclose.

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Figure 1. (A) Baseline and (B) post-ablation 12-lead electrocardiograms (ECGs). Baseline ECG demonstrates a delta wave suggestive of a left-sided posterolateral accessory pathway. Post-ablation ECG demonstrates absence of pre-excitation, indicating successful ablation of the accessory pathway.

Figure 2. 3D electroanatomic map of a posterolateral, extremely oblique AP. **(A)** The earliest AAS was identified within the CS at the 2 o'clock position of the MA during ventricular pacing. **(B)** The earliest VAS was identified at the 5 o'clock position of the MA during atrial pacing. Local activation times are colour coded, with white representing early activation times and blue representing late activation times. The site of successful ablation was located at the earliest ventricular insertion (VAS; **B**). AAS, atrial activation site; AP, accessory pathway; CS, coronary sinus; MA, mitral annulus; VAS, ventricular activation site.