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Para-Hisian Accessory Pathway: Mapping Using Open-Window and Ablation From the Aortic Cusp

Para-Hisian Aksesuar Yol: Açık-Pencere ile Haritalama ve Aortik Küspisten Ablasyon

CASE IMAGE
OLGU GÖRÜNTÜSÜ

A 28-year-old male with palpitations and a Wolff-Parkinson-White electrocardiographic pattern was referred to our division for ablation. The previous 3 ablation attempts from the right atrioventricular annular side performed at different times in the last year were unsuccessful. His conventional 12-lead surface ECG showed highly possible para-Hisian accessory pathway (AP) localization (Figure 1, Panel A). Prior to mapping, a decapolar catheter was advanced into the coronary sinus for intracardiac reference during activation mapping if orthodromic tachycardia developed. During baseline conditions and also after isoproterenol infusion, no sustainable atrioventricular reentrant tachycardia was induced. The AP effective refractory period was 220 milliseconds during programmed atrial stimulation under isoproterenol infusion. Localization and ablation of APs using a 3D electroanatomic mapping (EAM) system and open-window strategy have been previously defined.[1] The open-window strategy using a 3D EAM system (Carto®3, Biosense Webster Inc., Diamond Bar, Calif, USA) was performed during sinus rhythm. A 20-electrode multipolar mapping catheter with 2 mm inter-electrode distance (Pentaray™ Nav, Biosense Webster Inc.) was used for high-density mapping of the right atrium, tricuspid annulus, and right ventricular. For the open-window strategy, the window-of-interest (WOI) was set according to the surface electrocardiography QRS reference including QRS duration and estimated location of atrial and ventricular intracardiac signals obtained from the multielectrode catheter during sinus rhythm. Briefly, the WOI is the most important parameter applied to create an activation map. It is established by the interval preceding and following a reference line that specifies the predefined color of each acquired point projected on the anatomical map. The Advanced Reference Annotation algorithm annotated the reference line at the end of QRS. Accordingly, the WOI was set to 300 milliseconds with the leftward border at –290 milliseconds from the QRS end reference and the rightward border at 10 milliseconds from the QRS end reference (Figure 2, Panel A). Therefore, all bipolar and unipolar signals from the sinus node region to the right ventricular base were obtained. Automated and continuous acquisition of mapping points was performed using the Confidence module of the 3D EAM system (Confidence™, Biosense Webster Inc.). The wavefront annotation algorithm was used during the acquisition of points. Automatic annotation of local activation times obtained from the unipolar and bipolar signals of each electrode pair of the multielectrode mapping catheter uses the maximum negative slope and each unipolar signal is analyzed for its simultaneous bipolar signal. Namely, both bipolar and unipolar (the maximum negative slope) near-field signals were used to annotate local activation times collected from the multielectrode mapping catheter. The extended early-meets-late setting (15% and 85%) was done to delineate the atrioventricular annular region with activation block and unblocking region where the activation through the AP occurred.[2] The programmed atrial stimulation was performed to block the activation through the AP and to display His bundle potentials more clearly at the expected para-Hisian region. Thus, His bundle locations were marked and found to be just near the AP location (Figure 1, Panel B). The propagation mapping clearly demonstrated the AP location neighboring to the His bundle as the site of a breakout into the right ventricular (Video 1). No ablation attempt was done from the right atrioventricular annular region because of previous unsuccessful attempts. Also, we did not use the cryoablation with the Carto®3 system because the

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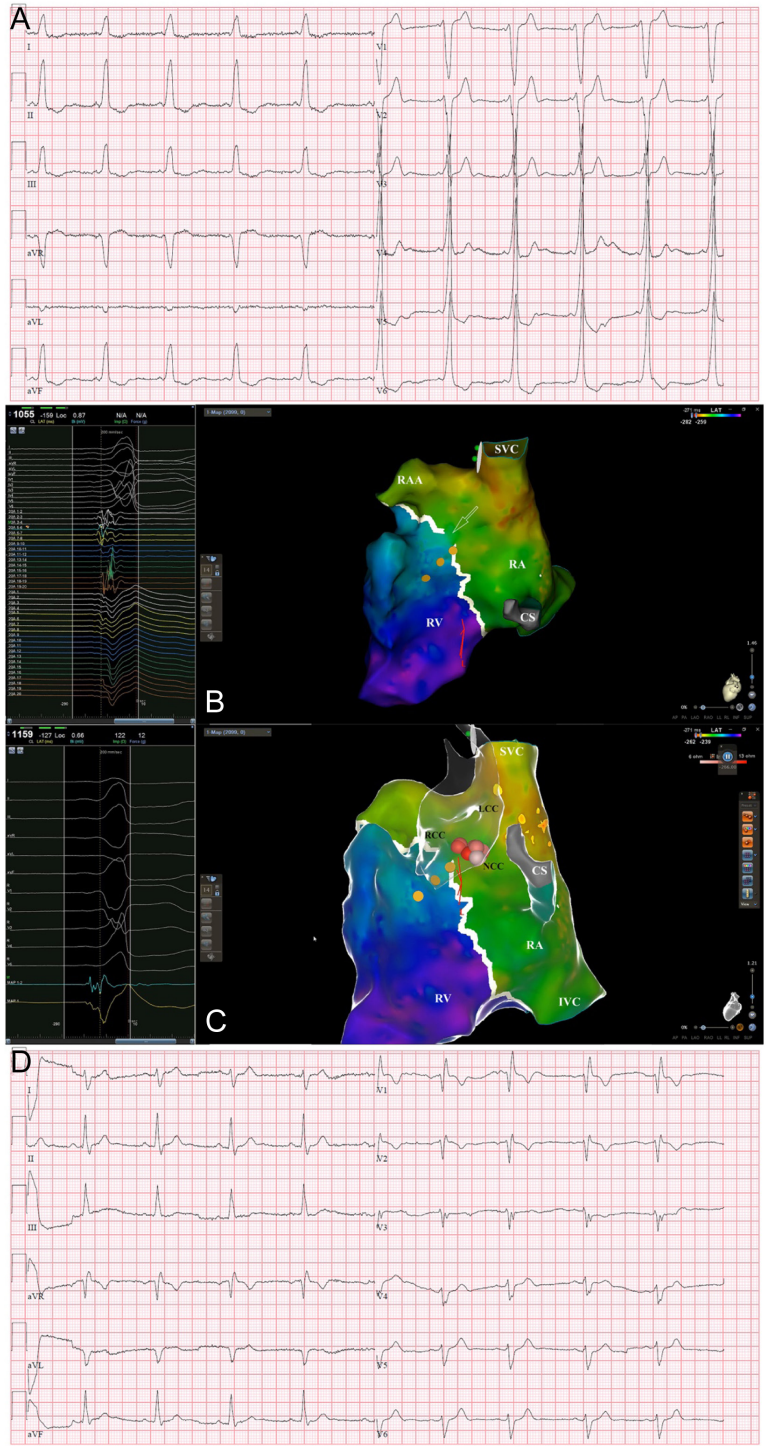

Figure 1. Baseline 12-lead surface electrocardiography demonstrating pre-excitation, highly suggestive of para-Hisian localization (A). Localization of para-Hisian accessory pathway (AP). High-density mapping with open-window strategy demonstrating the antegrade direction of activation from the right atrium to the right ventricular across the para-Hisian AP during sinus rhythm (white arrow). The white border indicates the conduction block across the tricuspid annulus using the extended early-meets-late setting. Yellow dots indicate the His bundle location. Intracardiac annotated signals from the multielectrode mapping catheter demonstrating activation wavefront across the AP (B). Localization and ablation of para-Hisian AP. Multi-tone red dots indicate ablation points in the non-coronary cusp of the aortic valve. Glass-view distal aorta lying over the para-Hisian region indicates the close anatomic relationship between this region and the non-coronary cusp (C). Post-procedural electrocardiography shows no pre-excitation with a right bundle branch block pattern, possibly due to previous ablation attempts (D). CS, coronary sinus; IVC, inferior vena cava; LCC, left-coronary cusp; NCC, non-coronary cusp; RA, right atrium; RAA, right atrial appendage; RCC, right-coronary cusp; RV, right ventricular, SVC, superior vena cava.

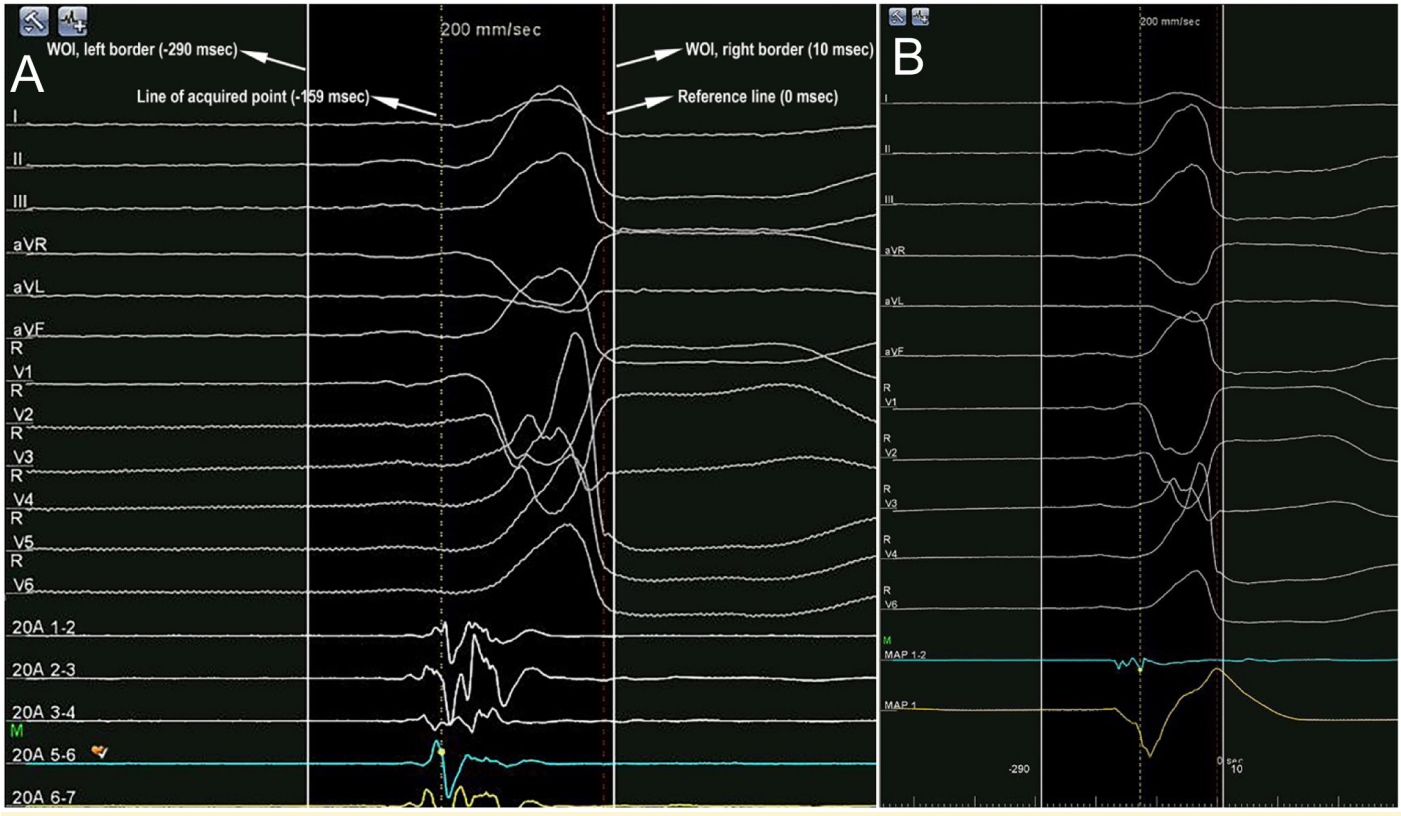

Figure 2. The WOI setting used for open-window mapping included a reference line (dashed red line) at the end of the surface QRS, a left border (the leftmost white line), and a right border (the rightmost white line) (A). Bipolar and unipolar intracardiac signals from the tip of the mapping catheter at the right para-Hisian region (B). WOI, window-of-interest.

Carto®3 system is a "closed" system that is only compatible with its navigational mapping catheters to clearly visualize the catheter and to map and ablate the arrhythmia with very high spatial accuracy. Impedance-based visualization, lower spatial localization accuracy, and fluoroscopy-needed mapping and ablation with a non-navigational catheter such as a focal cryo-catheter are drawbacks of cryoablation compared to proprietary navigational ablation catheters. Due to the close anatomical relationship between the para-Hisian region and the non-coronary cusp (NCC) of the aortic valve, the irrigated tip ablation catheter with contact-force sensing ability (ThermoCool SmartTouch® SF, Biosense Webster Inc.) was advanced into the NCC. As in the para-Hisian region, good atrial and ventricular signals without an isoelectric interval and the earliest ventricular signal from the onset of the surface delta wave of −30 milliseconds were observed compared to the right side (Figure 2, Panel B). No His potential was seen at this site. Delivering radiofrequency power of 35 W with a good contact force of 12 g at this site eliminated the AP in a few seconds and a maximum duration of 60 seconds was applied at this site. Additional ablation points were also given on locations adjacent to the first successful site (Figure 1 Panel C, Video 2). While the nodal block was observed during the adenosine testing, the presence of the AP was not detected. The total mapping time was 32 minutes, the number of acquired points during mapping was 2099 and the total ablation time was 210 seconds. No pre-excitation was observed in the follow-up electrocardiography (Figure 1, Panel D).

Informed Consent: Informed consent was obtained from the patient for the publication of the case image and the accompanying images.

Author Contribution: Concept – S.Ç.; Design – S.Ç.; Supervision – S.Ç.; Material – S.Ç.; Data Collection and/or Analysis – S.Ç; Writing – S.Ç.; Critical Review – F.Ö., Ö.Ö., M.K., S.T.

Video 1: Propagation mapping indicates the breakout site of activation right next to the His bundle (yellow dots) across the tricuspid annulus. The earliest site of activation is in the sinus node region.

Video 2: Ablation from the non-coronary cusp, overlying the para-Hisian region where the accessory pathway (AP) was located, eliminated AP within a few seconds.

References

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