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A Successful Case of Radiofrequency Ablation of Multiple Accessory Pathways in Ebstein's Anomaly Using Intracardiac Echocardiography

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A 47-year-old woman visited emergency department with palpitations. An electrocardiogram showed a regular narrow QRS tachycardia, which was terminated by intravenous adenosine. After termination, a 12-lead electrocardiogram (ECG) showed pre-excitation (Fig. 1A). The echocardiogram and computed tomography revealed apical displacement of the attachment of the septal tricuspid valve leaflet by 42 mm compared to the attachment of the anterior mitral valve leaflet (Fig. 1B, 1C), consistent with Ebstein's anomaly. She was referred for an electrophysiology study. The procedure was guided by fluoroscopy, an electro-anatomical mapping system (CARTO3™, Biosense-Webster), and intracardiac echocardiography (ICE) (Acunav, Siemens) to accurately locate the tricuspid annulus (TA), electrophysiogical atrioventricular groove, and the contact of ablation catheter tip (Fig. 2A). An orthodromic reentrant tachycardia was easily inducible, and the earliest atrial activity was recorded at the posterolateral portion of TA (Fig. 2B-2D). Guided by ICE, radiofrequency current was delivered at the site. However, when the eccentric retrograde atrial sequence shifted more septally, another form of tachycardia was induced (Fig. 2E, 2F). Radiofrequency current was delivered at this site, resulting ventriculoatrial dissociation. During follow-up of 5 years, the patients was without any symptoms and her ECG did not reveal any signs of pre-excitation.

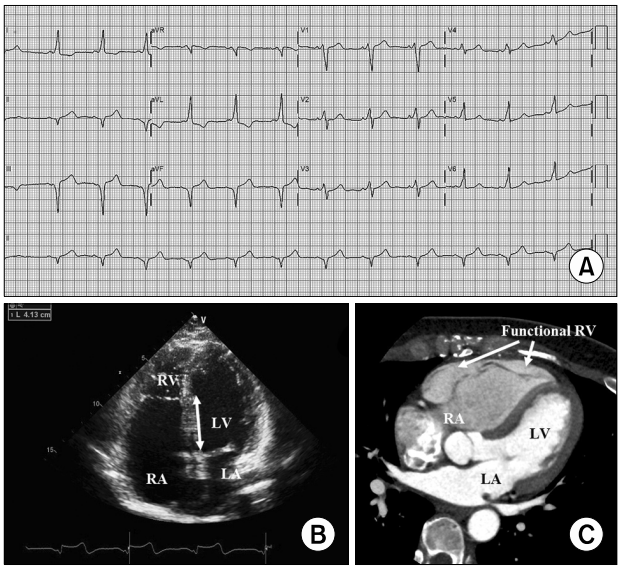

FIG. 1. (A) A 12- lead electrocardiogram showed ventricular pre-excitation after adenosine infusion. (B) Two-dimensional transthoracic echocardiography and (C) multiple detector cardiac computed tomography showed apical displacement of the attachment of the septal tricuspid valve leaflet by 42 mm compared with the attachment of the anterior mitral valve leaflet. LA: left atrium, LV: left ventricle, RA: right atrium, RV: right ventricle.

Catheter ablation of accessory pathway (AP) in Ebstein's anomaly may be challenging and has a lower success rate, primarily due to the presence of multiple and broad accessory pathways caused by abnormal formation of the insulating tissues at the atrioventricular junctions near the malformed tricuspid valve.[1,2] It is crucial to target the anatomical TA rather than the functional one. While coronary angiography was previously suggested for locating true accessory pathways, our case utilized electroanatomic mapping with ICE, enabling a straightforward identification of the true AP and guiding a successful ablation procedure.

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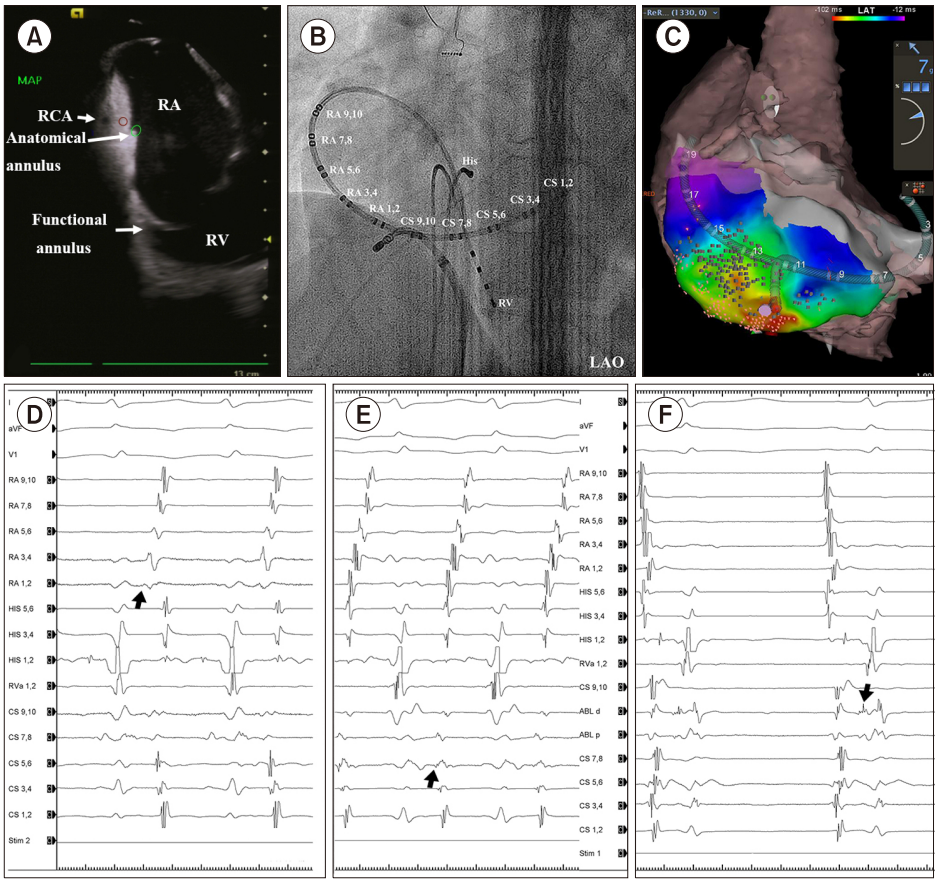

FIG. 2. (A) Intracardiac echocardiography was used to accurately determine the location of tricuspid annulus and electrophysiological atrioventricular groove corresponding to the course of the right coronary artery. The ablation catheter tip (green circle) was positioned along the right posterior atrioventricular groove area. (B) Fluoroscopy left anterior oblique view. (C) Electroanatomical mapping system (CARTO3^{TM}, Biosense Webster, Inc., Diamond Bar, CA, USA) demonstrated that the earliest atrial activity during orthodromic reentrant tachycardia was recorded at the posterolateral portion of tricuspid annulus (black arrow). (D) Intracardiac electrocardiogram of the first orthodromic reentrant tachycardia (ORT). The earliest atrial activity was recorded at RA 1-2 pair which was located at posterolateral portion of tricuspid annulus (black arrow). (E) Intracardiac electrocardiogram of another ORT. The earliest atrial activity was recorded at CS 5-6 pair (black arrow). (F) A distinctive accessory pathway potential was recorded (black arrow). CS: coronary sinus, His: his bundle, RA: right atrium, RCA: right coronary artery, RV: right ventricle.

CONFLICT OF INTEREST STATEMENT

None declared.

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