Simultaneous isolation of the four pulmonary veins by single-sided antral ablation

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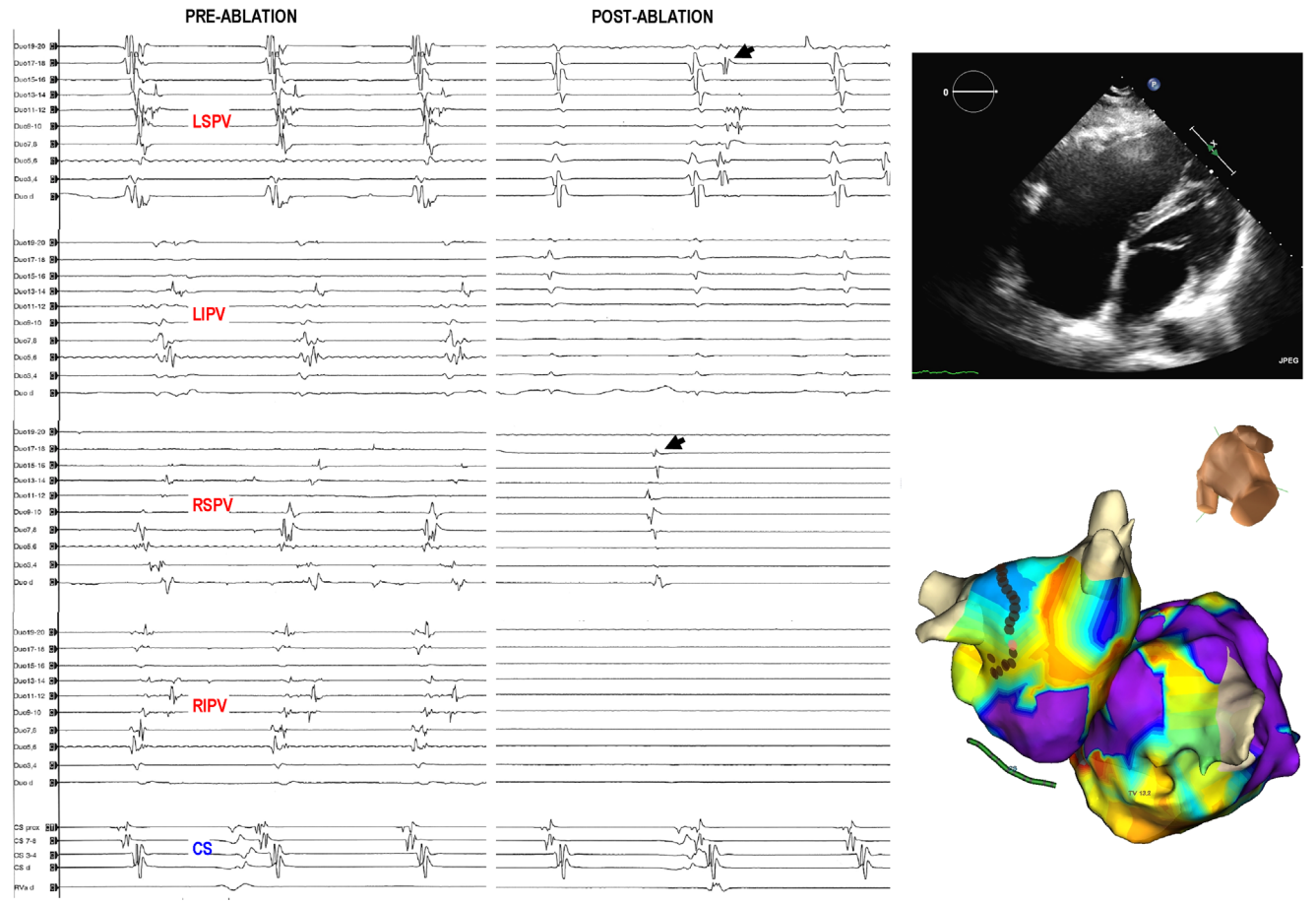

Figure 1 Intracardiac tracings from the left superior pulmonary vein (LSPV), left inferior pulmonary vein (LIPV), right superior pulmonary vein (RSPV), right inferior pulmonary vein (RIPV) and coronary sinus (CS): before ablation (left) and after left antral circumferential ablation (center). Transthoracic echocardiogram showing severe right atrial and right ventricular dilatation with apical displacement of the tricuspid valve leaflets (top right). Geometry of both atria generated by Ensite NavX; the brown dots indicate the ablation lesions around the left pulmonary veins antrum (bottom right).

KEYWORDS Single-sided ablation; Pulmonary vein isolation; Ebstein anomaly

ABBREVIATIONS PV = pulmonary vein

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Introduction

Pulmonary vein isolation (PVI) is the standard ablative strategy for the treatment of paroxysmal atrial fibrillation (AF), with success rates of 60-80% after a single procedure. [1-3] Antral ablation usually is preferred over ostial ablation in order to include ostial foci within the level of isolation and minimize the risk of pulmonary vein (PV) stenosis.

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KEY TEACHING POINTS

- Isolation of the pulmonary veins by contralateral antral ablation is a rare phenomenon.
- Certain cardiac conditions with extensive atrial/antral scaring may require a different approach during the pulmonary vein isolation procedure.
- Adequate differentiation of intracardiac signals by the Lasso catheter (near-field to far-field) is key for interpretation of electrophysiologic mechanisms.

Case report

A 60-year-old male patient with Ebstein anomaly and recurrent paroxysmal atrial fibrillation was referred for catheter ablation. His echocardiogram showed severe right atrial dilation (volume index 55 mL/m^2), moderate left atrial dilation (diameter 44 mm, volume index 40 mL/m^2), and severe tricuspid regurgitation. At the beginning of the study, the patient was in atrial tachycardia with earliest activation at the ostium of the superior vena cava. A transseptal puncture was performed, and the pulmonary veins (PVs) were targeted before mapping and ablation of the right atrial tachycardia. A voltage map of both atria during tachycardia revealed diffuse low-voltage areas compatible with extensive biatrial scarring (Figure 1, bottom right). A peak-to-peak electrogram amplitude was defined as follows: >0.5 mV = healthy (purple), 0.5 to 0.05 mV = diseased (multicolor), and <0.05 mV = scar (gray).[4,5] Exploration with the circular catheter showed PV potentials in all the PVs (Figure 1, left).

Ablation was started around the left common trunk, with quick isolation after only 4 radiofrequency applications at the posterior aspect of the antrum. The antral circumference was completed, and subsequently the right-sided PVs were assessed with a spiral catheter placed at the os of each PV. We observed unexpected simultaneous isolation with entrance and exit block (Figure 1, center; *arrows* indicate independent activity). Note that at baseline the timing of the local atrial signals in the right veins is relatively late with respect to the coronary sinus electrograms. This indicates that they correspond to the left atrium and not to the right atrium. After ablation, both the PV potentials and the local atrial signals disappeared from the circular catheter, suggesting that the whole antrum and not only the PVs were isolated.

Discussion

This phenomenon is uncommon, and we postulate that it may occur when the antral regions of the contralateral veins are connected by islets of viable tissue in the presence of diffuse left atrial scarring, as may be the case in patients with congenital heart disease.

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