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CARDIAC ARRHYTHMIA SPOT LIGHT

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Pseudothrombotic appearance on pulmonary valve by intracardiac echocardiography during atrial fibrillation ablation

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1 | CASE PRESENTATION

Intracardiac echocardiography (ICE) is useful to perform transseptal puncture safely and to identify the anatomy of left atrium and pulmonary veins (PVs) for atrial fibrillation (AF) ablation. We experienced a case with a thrombus-like image on pulmonary valve detected by ICE before transseptal puncture for AF ablation. The following assessment by multi-imaging modalities and the second ICE provided diagnosis of the imaging artifact by the pulmonary valve cusp and exclusion from the harmful mass.

A 72-year-old man with a history of drug-refractory paroxysmal AF was referred to our hospital for catheter ablation. Preprocedural electrocardiogram-gated dual source 128-slice cardiac computed tomography (CT) (Somatom Definition Flash; Siemens AG) at mid diastole showed no intracardiac thrombus. PV isolation (PVI) was attempted under uninterrupted anticoagulation. Throughout the procedure, intravenous heparin was administered to maintain an activated clotting time of 300 to 400 seconds. The ICE catheter (ViewFlex™ Xtra; Abbott) was inserted via the right femoral vein to the right atrium (RA) and assessed before transseptal puncture. The ICE images from the RA indicated thrombus-like floating mass (11 × 6 mm) on pulmonary valve (Figure 1) (Movie S1). We hesitated to perform right ventriculography which had a potential risk of pulmonary thromboembolism if the mass was true thrombus. We made a decision that the mass could not be ruled out as a thrombus, a vegetation, or a tumor, and that the procedure should be abandoned. The emergent contrast-enhanced CT (Non-ECG-gated, 64-slices, Optima CT660; GE Healthcare) demonstrated that no mass was observed on pulmonary valve (Figure 2A) and pulmonary thromboembolism did not occur. Similarly, every steady-state free precession image in cardiac magnetic resonance imaging (Discovery MR750; GE Healthcare), transthoracic echocardiography (TTE) (CX50 Xper; Philips), and transesophageal echocardiography showed the absence of mass on pulmonary valve (Figure 2B, 2C and 2D). No thromboembolism and no infectious signs were observed during the 4 week follow-up. The PVI was rescheduled and the assessment by ICE was performed again under the same anticoagulation therapy above. The ICE image (ViewFlex™ Xtra) from the RA showed the thrombus-like mass on pulmonary valve, similar to the image at the previous session (Figure 3A); however, the mass disappeared with the ICE catheter located on the right ventricular outflow tract (RVOT) (Figure 3B) (Movie S2). Furthermore, this finding was obtained without any catheters, which ruled out the possibility of another catheter-induced artifact. These findings suggested that the thrombus-like appearance was caused by an imaging artifact of ICE. The American Society of Echocardiography categorizes the mechanisms of two-dimensional echocardiographic artifacts into the following: (a) wave reflection and/or refraction-related artifacts including reverberation, acoustic shadowing, mirror artifact, and refraction artifact; (b) ultrasound beam property-related artifacts such as side lobe artifact and beam width artifact; and (c) equipment-related artifacts of near field clutter. These mechanisms are mentioned on TTE or TEE. In particular

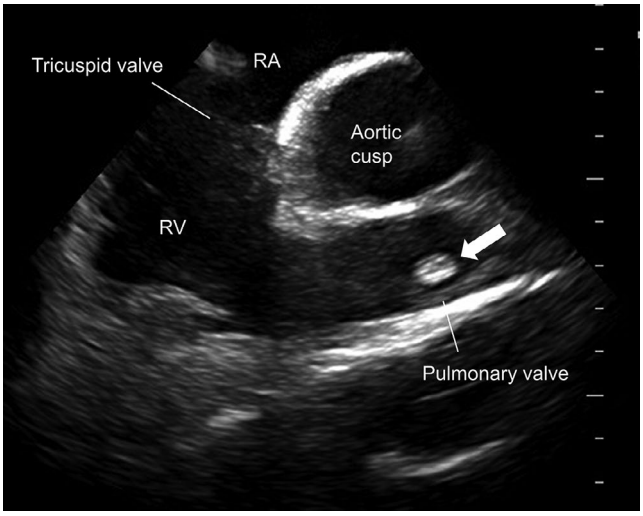

FIGURE 1 Pseudothrombotic appearance on pulmonary valve. A thrombus-like floating mass (11×6 mm) (white arrow) was detected by intracardiac echocardiography. RA, right atrium; RV, right ventricle

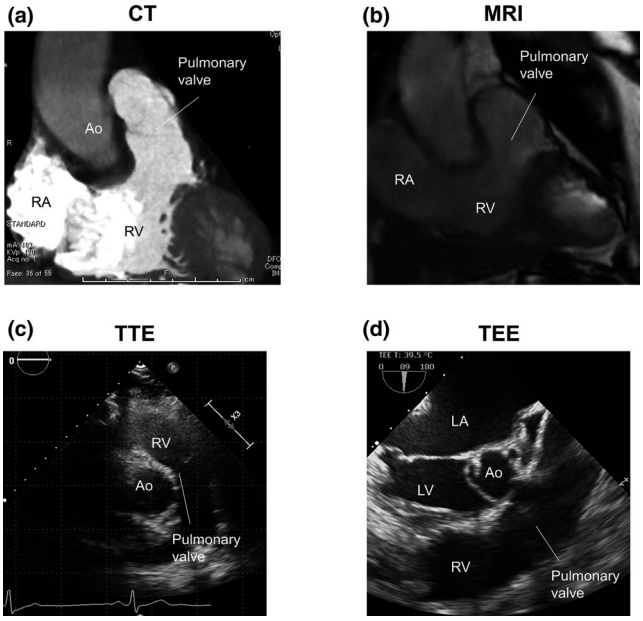

FIGURE 2 Absence of the mass on pulmonary valve by multi-imaging modalities. No mass was observed on the contrast-enhanced computed tomography (CT) (A), cardiac magnetic resonance imaging (MRI) (B), transthoracic echocardiography (TTE), and transesophageal echocardiography (TEE) (D). RA, right atrium; RV, right ventricle; Ao, Aorta; LA, left atrium; LV, left ventricle

on TEE, a reverberation of the warfarin ridge could mimic a thrombus in the left atrial appendage. However, there has been little discussion on the typical artifacts of ICE. It remains unclear whether those mechanism are also applicable to ICE. Possible mechanisms of thrombus-like imaging artifact for this case were speculated as follows. (a) A reverberation artifact, which arises from the strong reflectors, such as high echoic structures, could mimic the thrombus. Figures 1 and 3A shows that there is no obvious calcification

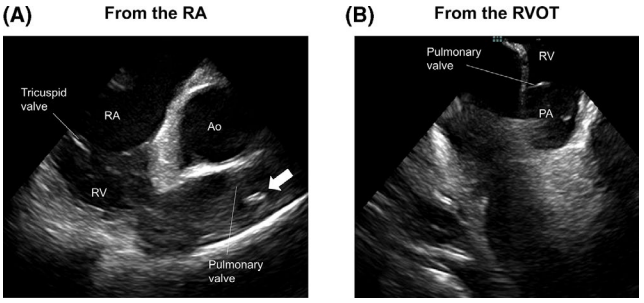

FIGURE 3 Appearance and disappearance of the mass on pulmonary valve from the position of the intracardiac echocardiography (ICE) catheter. In the second ICE, thrombus-like floating mass (white arrow) was redetected by the ICE catheter from the right atrium (A); however, the mass disappeared with the catheter located on the right ventricular outflow tract (B). PA, pulmonary valve; RA, right atrium; RV, right ventricle; RVOT, right ventricular outflow tract

on the aortic cusps, but high echoic signals on the aortic wall. These high echoic structures might act as the strong reflectors. (b) The ICE beams to the cusps of pulmonary valve could directly make the thrombus-like appearance.

A case report similar to our case was focused on "pseudo-tumor" of the RVOT beneath the pulmonary valve in TTE. In the case, pulmonary regurgitation caused by the large fenestration of pulmonary valve was a speculation on the mechanism of the "pseudo-tumor" appearance. Our case had no pulmonary regurgitation. Therefore, the mechanism of the imaging artifact seems to differ from that of the previous case. To the best of our knowledge, the present case is the first case of the imaging artifact in ICE during catheter ablation. The different ICE catheter position helps exclusion from the thrombus or the tumor, in accordance with multi-modality assessments. The knowledge of these findings could be useful for a safety management of AF ablation and avoidance of an unnecessary interruption of the procedure.

CONFLICT OF INTEREST

Authors declare no conflict of interests for this article.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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