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Rapid communication

Successful cryoballoon pulmonary vein isolation in a patient with situs inversus and dextrocardia

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ABSTRACT

A 79-year-old man with situs inversus and dextrocardia underwent catheter ablation of symptomatic paroxysmal atrial fibrillation. Pulmonary vein isolation (PVI), using second-generation cryoballoon under Ensite NavX system guidance, was performed successfully in a reverse manner, which required short procedure and fluoroscopy times, as required in a PVI performed on a normal heart without any complications. Cryoballoon-based PVI under Ensite NavX guidance was feasible and safe to achieve a favorable outcome in this patient with abnormal anatomy.

1. Introduction

In recent years, second-generation cryoballoon-based pulmonary vein isolation (PVI) is increasingly being used in paroxysmal atrial fibrillation (AF) patients. To the best of our knowledge, PVI using the cryoballoon system in a patient with situs inversus and dextrocardia has not been described till date. This article briefly describes successful PVI for paroxysmal AF in a patient with complete situs inversus.

2. Case report

A 79-year-old man with situs inversus and dextrocardia, without any underlying disease linked to that disorder, was referred for catheter ablation of symptomatic, drug-refractory, paroxysmal AF (Fig. 1A and B). After written informed consent was obtained, the procedure was performed. A 7Fr intracardiac defibrillation catheter (Inquiry™ Luma-Cath™, St Jude Medical, Inc.) was introduced into the coronary sinus (CS) via the right subclavian vein. Single trans-septal puncture was performed via the left femoral vein under intra-cardiac echocardiogram (ViewFlex™ Xtra, St Jude Medical, Inc.) guidance using the modified Brockenbrough technique and an 8.5Fr trans-septal sheath (TS) (SL1, St Jude Medical, Inc.). The TS was exchanged over a guidewire for a 12Fr steerable sheath (FlexCath Advance, Medtronic, Inc.).

Mapping and ablation were performed using the NavX system (St. Jude Medical, Inc.) for guidance after the integration of a 3-dimensional model of the left atrial and pulmonary vein (PV) anatomy obtained from pre-interventional computed tomographic imaging (Fig. 2B). Ostial PV recordings were obtained with a 7Fr catheter containing a deflectable decapolar Lasso loop of variable diameter size (15–25 mm) (Optima, St Jude Medical, Inc.). The second-generation 28-mm cryoballoon (Arctic Front Advance™, Medtronic, Inc.) was advanced into the left atrium using a spiral mapping catheter (20 mm diameter Achieve, Medtronic, Inc.) as a guidewire. The cryoballoon was inflated proximal to the PV ostium followed by a gentle push aiming at complete sealing of the antral aspect of the PV. Contrast medium injected through the central lumen of the cryoballoon was used to verify complete occlusion of the PV ostium (Fig. 2A). This was followed by a freeze cycle of 180 s. If PVI was achieved after 60 s or not confirmed during freeze, an additional bonus freeze of 120 s was applied. During cryoenergy application along both PVs, continuous pacing of the phrenic nerve (PN) was performed using a diagnostic catheter (7Fr, Biosense Webster, Inc.) positioned within the superior vena cava and the right subclavian vein. After 1 ablation with perfect PV occlusion, PVI was checked using an Achieve catheter. The right superior PV (RSPV), the right inferior PV (RIPV), and left inferior PV

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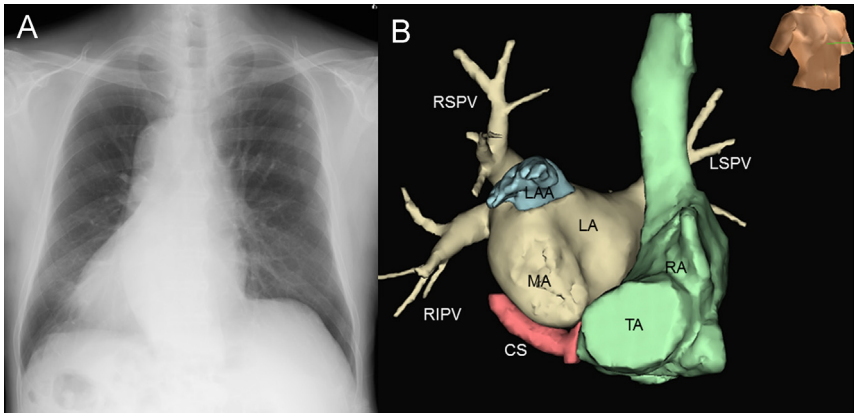

Fig. 1. A: Chest radiogram demonstrating the right-sided heart. B: The RAO view of the 3D reconstruction of a contrast-enhanced computed tomogram. RA: functional right atrium, LA: functional left atrium, TA: tricuspid annulus, MA: mitral annulus, CS: coronary sinus, LAA: left atrial appendage, RSPV: right superior pulmonary vein, RIPV: right inferior pulmonary vein, LSPV: left superior pulmonary vein.

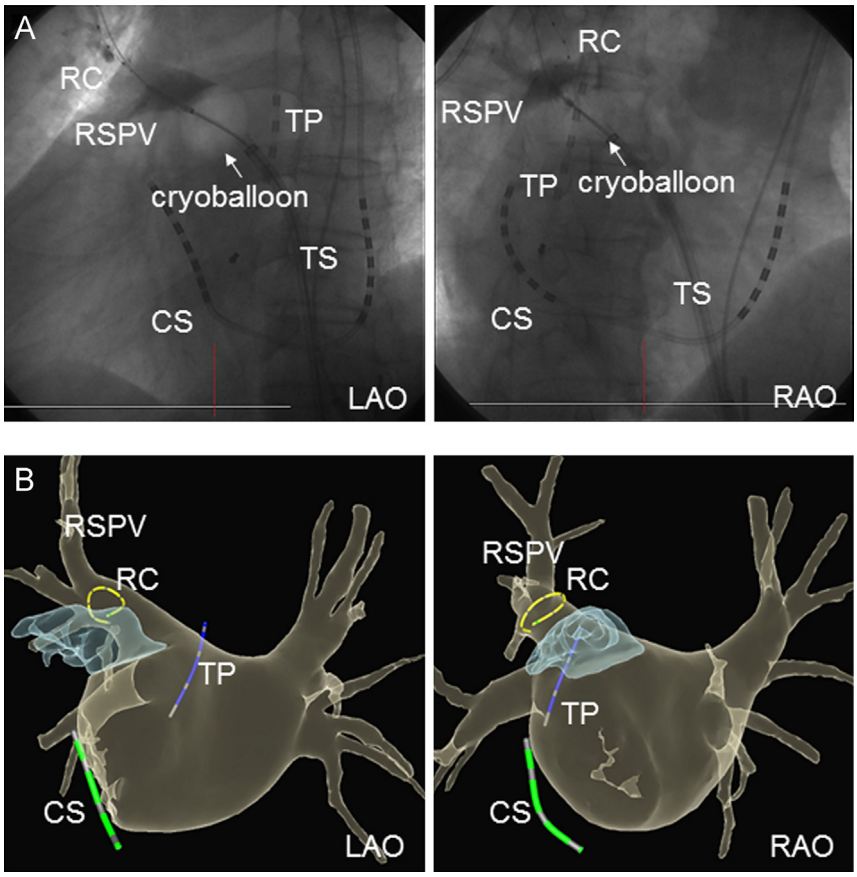

Fig. 2. A: Fluoroscopic views in LAO and RAO, including 1 diagnostic catheter placed in the coronary sinus (CS), temperature prove (TP) in the esophagus and the 12Fr steerable trans-septal sheath (TS). The cryoballoon with an Achieve catheter (RC) was placed in the RSPV. Selective PV occlusion angiography of the RSPV with a 28-mm cryoballoon to evaluate balloon to left atrium-PV junction contact was performed. At complete occlusion, the contrast medium remained within the RSPV. B: The LAO and RAO views of the left atrium and PV anatomy using a 3-dimensional model, including 1 diagnostic catheter placed in the CS (green catheter) and TP (blue catheter) in the esophagus. The Achieve catheter (RC: yellow catheter) was placed in RSPV during the freezing cycle. RSPV: right superior pulmonary vein.

(LIPV) were all isolated after 1 freeze; electric isolation of the left superior PV (LSPV) required 1 additional freeze. The RIPV, LSPV, and LIPV were subjected to an additional bonus freeze. After the ablation of all the PVs, the cryoballoon was exchanged for the ring catheter to check for PVI success. Finally, all PVs were successfully isolated using the exclusive second-generation 28-mm cryoballoon. Total procedure and fluoroscopy time were 120 min and 24 min, respectively.

The next day, pericardial effusion, pneumothorax, and esophageal injury were ruled out based on chest radiography, transthoracic echocardiography, and upper gastrointestinal endoscopy findings, respectively. After a short duration follow-up of 120 days, the patient was in stable sinus rhythm without AF.

3. Discussion

Catheter-based PVI using radiofrequency current may be a complex and a challenging procedure in patients with situs inversus and dextrocardia. PVI was successfully performed in this

patient with situs inversus and dextrocardia using 3-dimensional mapping system [1,2], magnetic navigation system [3], and robotic navigation system [4]. To the best of our knowledge, this is the first report illustrating successful cryoballoon-based PVI in a patient with situs inversus and dextrocardia. To prevent phrenic nerve paralysis, we stimulated both phrenic nerves since left-sided phrenic nerve paralysis has been reported in literature after cryoballoon-based PVI in a patient with normal heart [5] and our patient has an unusual anatomy. Our patient had no minor anomaly. In general, congenital heart disease and pulmonary hypoplasia are rare in dextrocardia with situs inversus compared to isolated dextrocardia and dextrocardia associated with situs ambiguous. PVI using a cryoballoon may be more challenging in patients with dextrocardia of the other types. Additionally, cryoballoon-based PVI was performed under Ensite NavX three-dimensional mapping system guidance. Visualization of the ring catheter on the Ensite NavX system enabled the understanding of anatomy and reduction of exposure making the procedure less invasive and safer. As a result, the procedure and fluoroscopy time for our patient were as short as those in normal heart patients.

Conflict of interest

All authors declare no conflict of interest related to this study.

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