

# Successful catheter ablation of atrial tachycardia in cor triatriatum sinister: A figure-of-8 reentry in the left atrial membrane



Ayako Okada, MD, PhD,\* Ken Kato, MD,\*<sup>†</sup> Morio Shoda, MD, PhD,\*<sup>‡</sup>  
Hiroaki Tabata, MD,\* Koji Yoshie, MD, PhD,\* Koichiro Kuwahara, MD, PhD\*

From the \*Department of Cardiovascular Medicine, Shinshu University School of Medicine, Nagano, Japan,

<sup>†</sup>Department of Cardiology, Tokyo Metropolitan Tama Medical Center, Tokyo, Japan, and

<sup>‡</sup>Department of Cardiology, Tokyo Women's Medical University, Tokyo, Japan.

## Introduction

Cor triatriatum sinister is a rare form of congenital heart disease consisting of an abnormal membrane in the left atrium (LA) that divides it into anterior (inferior) and posterior (superior) chambers.<sup>1</sup> Patients with cor triatriatum carry the risk of arrhythmias, especially atrial fibrillation (AF), atrial flutter, and atrial tachycardia (AT).<sup>2</sup> We herein present a case of a successful catheter ablation (CA) of a reentrant AT within an abnormal membrane associated with cor triatriatum sinister using the CARTO coherent mapping system (Biosense Webster, Inc, Diamond Bar, CA).

## Case report

A 71-year-old man with cor triatriatum sinister was referred to our department in June 2020 for CA of paroxysmal AF and AT. Intracardiac echocardiography and preprocedural multislice spiral computed tomography revealed a membrane extending from the interatrial septum to the roof and lateral wall of the LA. The posterior chamber received all 4 pulmonary veins (PVs), while the anterior chamber contained the left atrial appendage and was connected to the mitral valve (Figure 1A and 1B). No evidence of any congenital heart diseases other than cor triatriatum was detected.

A transseptal puncture from the right atrium to the posterior chamber of the LA was completed under fluoroscopic and intracardiac echocardiography guidance. Successful isolation of all 4 PVs and the superior vena cava was achieved with the assistance of CARTO. Thereafter AT was induced by burst atrial pacing at a cycle length of 300

## KEY TEACHING POINTS

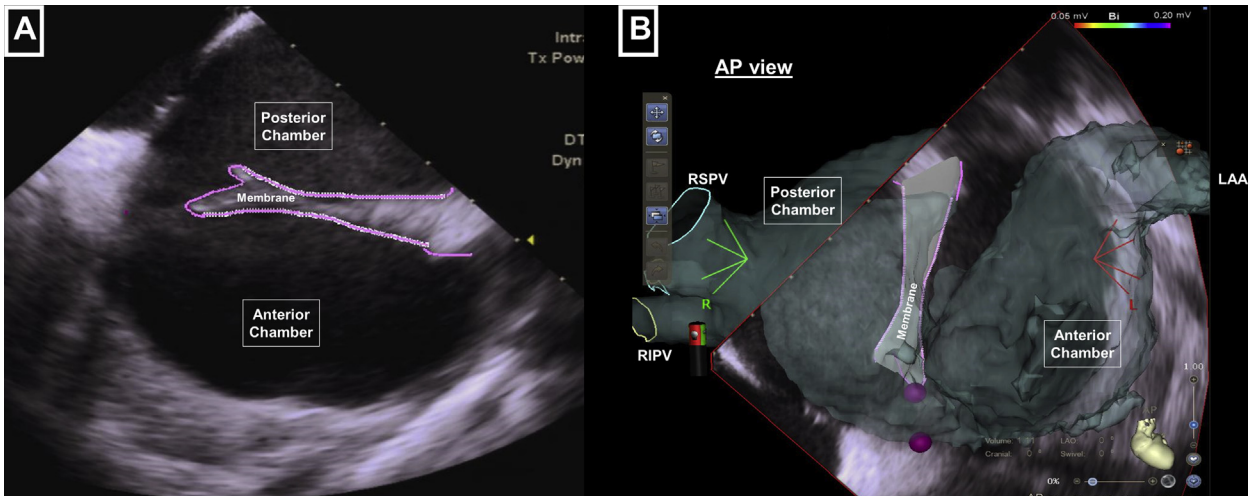
- Cor triatriatum sinister has various anatomical variants and is often seen in association with other cardiac abnormalities.
- Preprocedural multislice spiral computed tomography and intracardiac echocardiography are highly informative for delineating the complex anatomical structures in cor triatriatum sinister.
- The intra-atrial membrane, which divides the atrium, could be excitable tissue and an arrhythmogenic substrate.
- A high-density electroanatomical mapping system with a coherent map feature could provide guidance to prove the reentrant circuit of complex congenital heart diseases.

ms, and the tachycardia cycle length was 293 ms. The activation map during AT was constructed using a PentaRay multipolar catheter (Biosense Webster, Inc). In the CARTO coherent map with integration of the vector and velocity information in the LA, the wavefront from the LA anterior wall spread onto the free wall of the anterior chamber, then turned around to the anterior and posterior walls of the posterior chamber (Supplemental Videos 1 and 2). The reentrant circuit appeared to be a figure of 8 in the membrane and anterior chamber (Supplemental Video 3). The activation map of the LA revealed fragmented potentials in the membrane close to the anterior wall of the anterior chamber (Figure 2A).

An ablation catheter (NAVISTAR THERMOCOOL, Biosense Webster, Inc) was directed to the area of the fragmented potentials (Figure 3A and 3B), and the AT was terminated within several seconds during the first radiofrequency application (Figure 3C). Programmed atrial pacing with an isoproterenol infusion could not induce any atrial tachyarrhythmias

**KEYWORDS** Atrial tachycardia; CARTO coherent mapping; Cor triatriatum sinister; Reentry  
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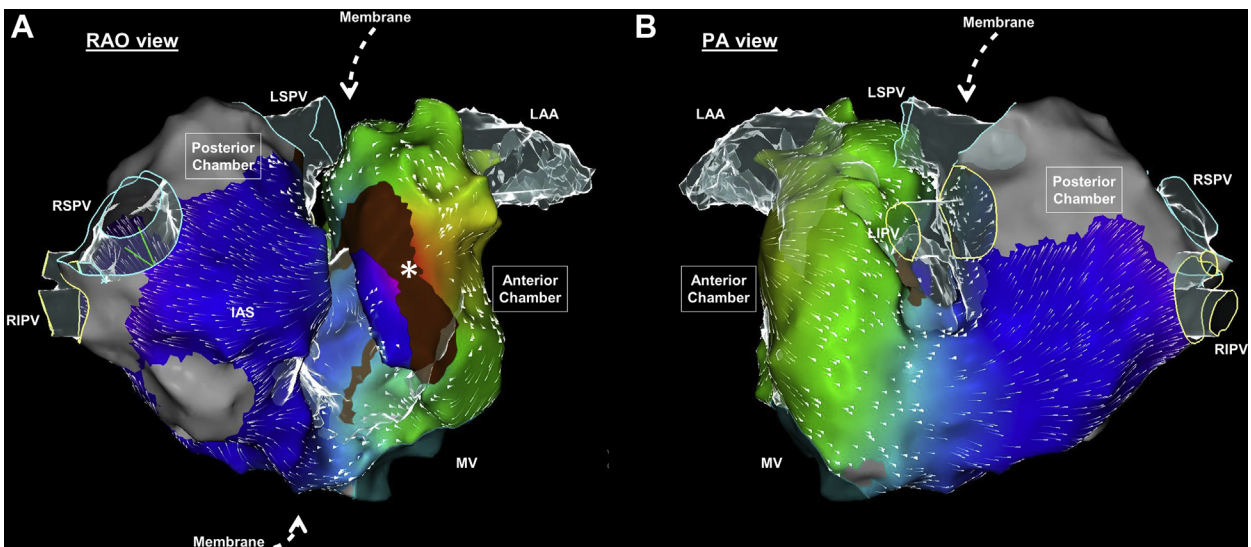
**Figure 1** **A:** Intracardiac echocardiography (CARTO SOUND; Biosense Webster, Inc, Diamond Bar, CA) showing the intra-atrial membrane subdividing the left atrium (LA) into the anterior (mitral valve site) chamber with the LA appendage (LAA) and posterior (pulmonary veins site) chamber. **B:** The CARTO merge image using multislice spiral computed tomography with the CARTO SOUND system. AP = anterior posterior; RIPV = right inferior pulmonary vein; RSPV = right superior pulmonary vein.

after the point ablation. No complications were recognized during the procedure. The patient currently remains free from any paroxysmal AF and AT recurrence during a follow-up period of 5 months.

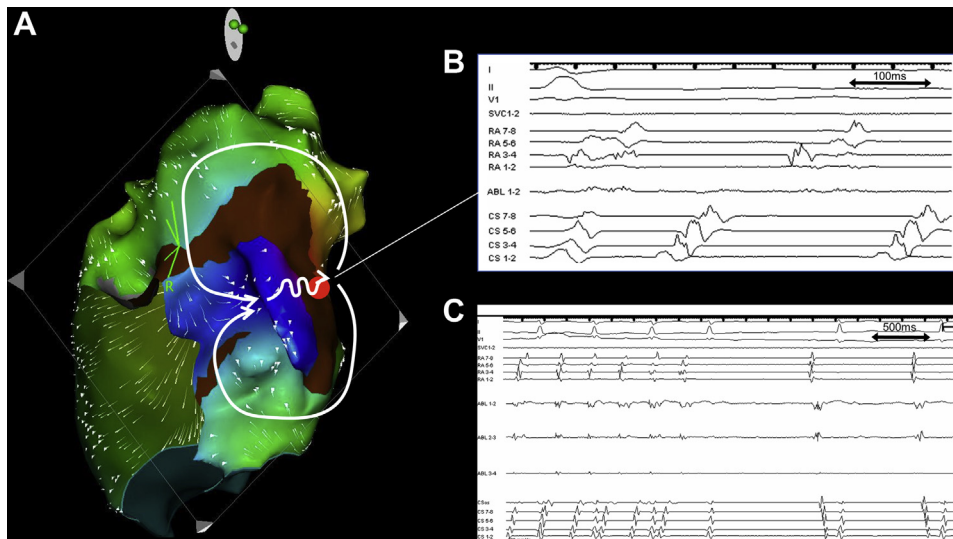
**Discussion**

Cor triatriatum sinister is a rare congenital anomaly that may be complicated with other structural heart diseases.<sup>3</sup> Communication between the 2 chambers usually occurs through windows in the membrane, which can vary in diameter and

be associated with a transmembrane pressure gradient.<sup>4,5</sup> Previous reports have described cases of AF ablation for cor triatriatum.<sup>6-8</sup> Yamada and colleagues stated that the transeptal approach to the LA in cor triatriatum sinister might depend on the anatomical relationship between the PVs and the membrane.<sup>5</sup> In the present case, the detailed LA and membrane anatomical information delineated by multislice spiral computed tomography imaging with intracardiac echocardiography provided clear orientation of the septal puncture site and a precise mapping procedure.<sup>9,10</sup> The electrical excitability of the membrane in the cor



**Figure 2** Activation map of the left atrium (LA) during atrial tachycardia. **A:** Right anterior oblique (RAO) view. **B:** Posterior anterior (PA) view. The activation pattern is shown by the color gradation (red-orange-yellow-green-blue-violet), and the conduction vector and velocity are drawn by the white drops (coherent map). The figure-of-8 reentry is observed in the membrane, along with passive conduction on the LA free wall and interatrial septum (IAS). Fragmented potentials are recorded in the membrane close to the anterior wall of the anterior chamber (white asterisk). LAA = left atrial appendage; LIPV = left inferior pulmonary vein; LSPV = left superior pulmonary vein; MV = mitral valve; RIPV = right inferior pulmonary vein; RSPV = right superior pulmonary vein.



**Figure 3** A: Activation map of the anterior chamber (the posterior chamber is removed by the cutting plane) during the atrial tachycardia (AT) in the right anterior oblique and caudal views. The focal ablation point is indicated by the red circle. B: Intracardiac electrogram recorded by the ablation catheter. C: The AT terminates shortly after the first radiofrequency application and then becomes noninducible.

triatriatum is unknown. The reentrant circuit with a figure of 8 could be outlined in the membrane using CARTO coherent mapping,<sup>11</sup> which was recently developed and could enhance an interpretation of electrical propagation using spindle-shaped markers, which represented vectors of the excitation. The CARTO mapping could visualize the precise activation pattern not only in the membrane but also in the anterior and posterior chambers, and it could demonstrate the area of fragmented potentials close to the areas of slow or no conduction (termed “SNO zones,” colored brown in Figure 3A). Recognition of the fragmented potentials close to the SNO zone provided clear guidance for an appropriate ablation target. The CARTO system with coherent mapping could provide important information, especially in cases with complex congenital heart disease.

### Acknowledgment

Consent for publication of this case was obtained from the patient.

### Appendix Supplementary data

Supplementary data associated with this article can be found in the online version at <https://doi.org/10.1016/j.hrcr.2020.11.013>.

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