

Successful atrioventricular nodal reentrant tachycardia ablation in a female patient with left isomerism

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Introduction

Atrioventricular nodal reentrant tachycardia (AVNRT) is the most common paroxysmal supraventricular tachycardia (PSVT) among adults. Catheter ablation is an effective treatment for AVNRT. However, the success of catheter ablation may vary on the basis of anatomical variations and conduction tissue anomalies. In this case report, we aimed to present an AVNRT case with left isomerism.

Case Report

A 49-year-old female patient with a longstanding history of PSVT was referred to our cardiology department for an electrophysiology study and catheter ablation. She had a history of failed AVNRT slow pathway ablation in 2009 because of an undefined congenital disease. She had several visits to the emergency room due to PSVT after 2009.

Her resting electrocardiogram (ECG) showed that P-wave was negative in lead II and III and isoelectric in lead I. A 12-lead ECG during tachycardia showed an arrow QRS tachycardia (heart rate: 162 beats per minute) with no P waves (Fig. 1). Her biochemical parameters were normal, and hemoglobin level was within normal limit. A transthoracic echocardiography study showed no visible inferior vena cava (IVC). The patient underwent contrast-enhanced thoraco-abdominal computed tomography (CT) before the electrophysiology study (EPS). The CT image revealed an interruption of intrahepatic IVC with azygos vein continuation (arrowheads), midline located liver, right-sided stomach, right-sided multiple spleens (white arrows), bilateral hyperarterial bronchus (black arrows), and bilobed lungs, which were compatible with left isomerism (polysplenia syndrome). Moreover, the CT image showed an aberrant right subclavian artery but no abnormal pulmonary venous return (Fig. 2).

A standard EPS was performed with the superior vena cava (SVC) approach. Only 2 catheters could be placed into the heart chambers because of anatomical variation. The cannulation of the coronary sinus (CS) was difficult; a decapolar catheter was inserted through the subclavian vein and SVC. The diagnostic catheter could be advanced into the right heart chambers through the right femoral vein, azygos vein, and SVC. A total of 2 catheters were positioned to the His bundle and CS, respectively. In the EP study, basal intervals were within normal limits,

and atrio-His (AH) and His-ventricular (HV) intervals were 110 and 42 ms, respectively. Retrograde concentric ventriculoatrial (VA) conduction was observed when the catheter was positioned to the right ventricular apex. At baseline, typical AVNRT was reproducibly induced during atrial stimulation after an AH interval gap. The arrhythmia was characterized by a cycle length of 410 ms and VA of 40 ms. Programmed atrial stimulation revealed dual AV nodal physiology with an AH jump of 90 ms followed by reproducible induction of a narrow complex tachycardia. Overdrive ventricular pacing entrained tachycardia with a V-A-V response. Other pacing maneuvers were consistent with the slow-fast form of AVNRT, which consisted of the slow pathway as the anterograde limb and the fast pathway as the retrograde limb. We preferred the Thermocool SF ablation catheter (Biosense Webster) for catheter ablation to decrease radiation exposure and increase ablation success. The ablation catheter was advanced to the right heart chambers via the right femoral vein, azygos vein, and SVC. For slow pathway ablation, we used a mixed approach; first, we looked for a slow pathway potential but failed, and then used an anatomical approach. The ablation catheter was placed with difficulty into the septal por-

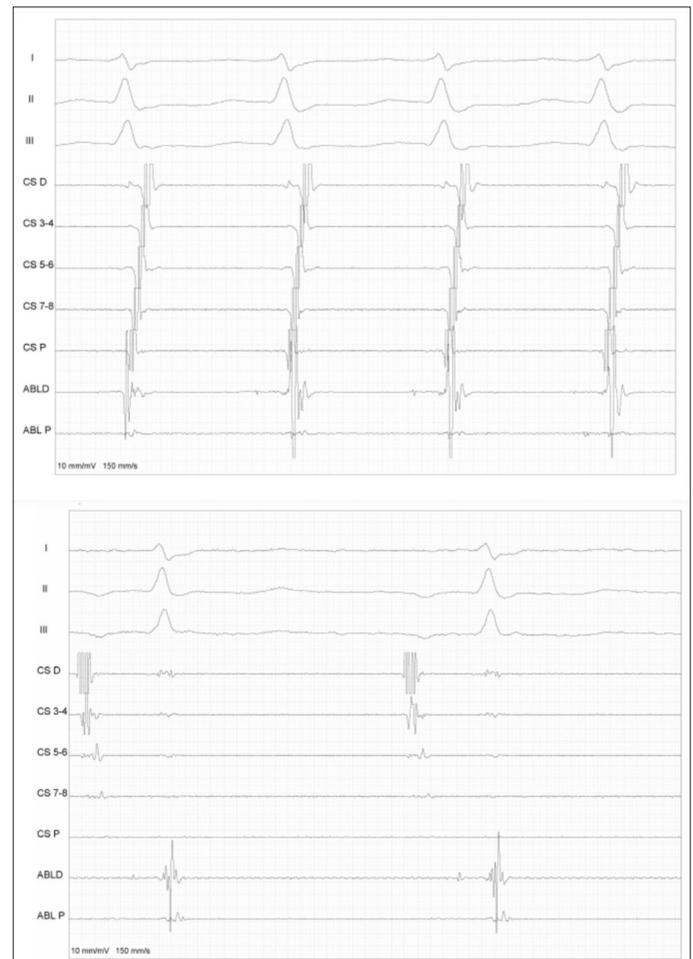


Figure 1. A 12-lead ECG during tachycardia showed an arrow QRS tachycardia (heart rate: 162 beats per minute) with no P waves

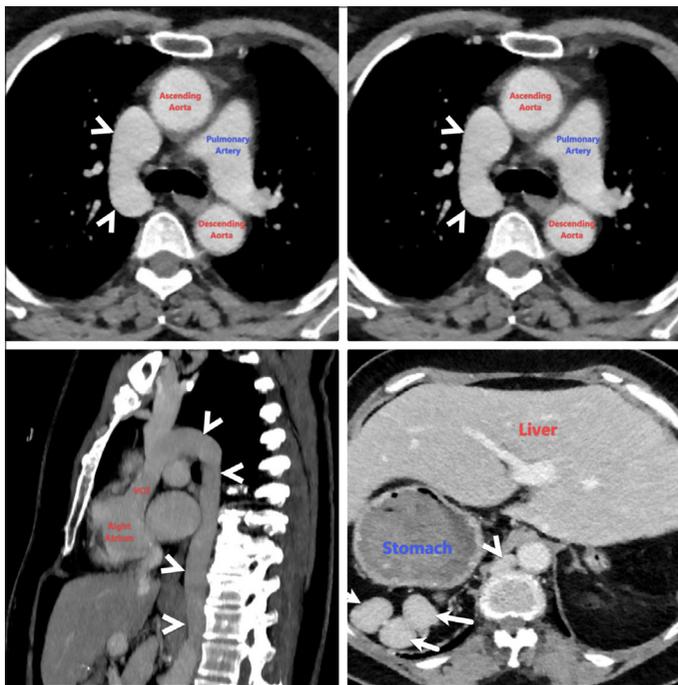


Figure 2. CT image showed an aberrant right subclavian artery but no abnormal pulmonary venous return

tion of the tricuspid valve. The radiofrequency settings were a power of 30 to 40 W and a temperature of up to 60°C. After the 6th application, a junctional rhythm was obtained (Fig. 3) and successful endpoint was achieved. We repeated the stimulation protocol under IV isoproterenol. We waited 30 minutes before considering the procedure complete. The patient was discharged 24 hours after the procedure and was followed up at 1 and 6 months. She had no symptoms or tachycardia.

Discussion

Left isomerism is very rare in the general population. The incidence of arrhythmia is high in patients who have left isomerism (1). Catheter ablation is a good therapeutic option to achieve a cure for tachyarrhythmia. However, there are considerable limitations for a catheter approach to the heart in patients with left isomerism. One of the major challenges in our patient was difficulty in entering the cardiac chambers. Therefore, we used an azygous vein approach for entering the cardiac chambers, and catheter ablation was performed with an electroanatomic mapping system. Unlike conventional methods, using electroanatomic mapping is a valid option with a high chance of success and limited fluoroscopy exposure. Alternative solutions are the retrograde arterial route or percutaneous puncture of the hepatic or internal jugular veins (2, 3).

Bodily isomerism or heterotaxy is known as a syndrome in which the internal thoraco-abdominal organs are abnormally located along the left-right axis of the body. This syndrome includes very complex patients, including the isomerism of the right and left atrial extensions (1). Bodily isomerism is a unique clinical entity associated with congenital malformations of the

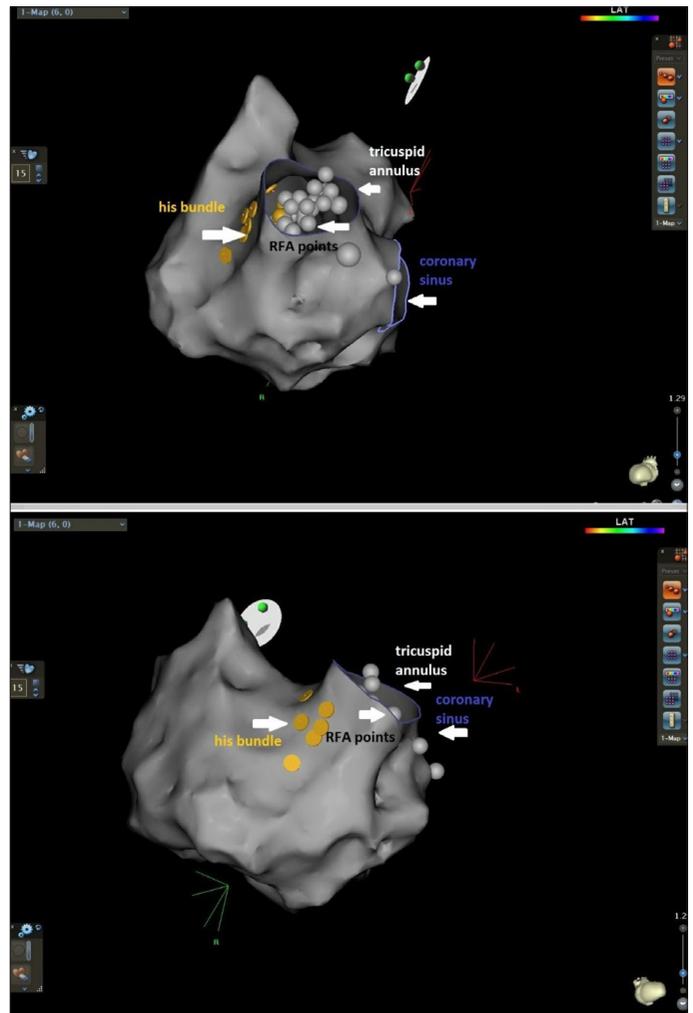


Figure 3. After the 6th application, a junctional rhythm was obtained

heart, which further increases the risk for future cardiovascular complications.

The effects of isomerism are often present in the cardiac conduction system and can lead to clinical arrhythmias. Those with right isomerism may have twin sinoatrial nodes or twin atrioventricular (AV) nodes and subsequently, have a greater risk for developing AVNRT (1). Those with left isomerism may have an absence of a sinoatrial node and are at a greater risk for developing AV block. The resting ECG of our patient showed a negative P-wave in leads II and III and isoelectric lead I, which was consistent with left isomerism, but we did not diagnose twin AV nodes. Cardiac arrhythmias because of atrial isomerism usually present in childhood and are associated with complex cardiac malformations (4). Our patient was 49 years old, and she had no cardiac malformation.

There are a few cases of syndrome and tachycardia. Suman-Horduna et al. (1) have presented 8 patients who had supraventricular arrhythmias with atrial isomerism and who underwent catheter ablation procedures. They claimed that the use of remote magnetic navigation along with 3D mapping facilitated the procedures and resulted in a short radiation time. In another study, Papagiannis et al. (5) have reported 3 patients

with congenital heart disease with right atrial isomerism and they claimed that heterotaxy syndromes might have a high incidence of twin AV nodes, creating a substrate for a macroreentrant tachycardia. The ablation of AVNRT in the context of complex congenital heart disease has been shown to have a high incidence of AV block. Cryoablation should be considered due to the absence of usual anatomical marks for catheter position.

Conclusion

In this case report, we described a case of typical slow-fast AVNRT in a patient with left isomerism. Catheter ablation of AVNRT in left isomerism is difficult due to the complex anatomy. A major challenge in left isomerism is the difficulty in entering the cardiac chambers. Using a superior approach via the azygos vein is a feasible, effective, and safe therapeutic option.

Informed consent: Informed consent was obtained from the patient.

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