Slow Pathway Modification in a Patient with D-Transposition of the Great Arteries and Atrial Switch Procedure

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KEYWORDS

• Congenital heart disease • Transposition of the great arteries • Supraventricular tachycardia • Atrioventricular nodal reentrant tachycardia

KEY POINTS

- Patients are often not able to tolerate frequent, rapid, or incessant atrial arrhythmias without developing significant symptoms and ventricular dysfunction.
- Atrial arrhythmias are associated with an increased risk of ventricular arrhythmias and sudden cardiac death.
- Rhythm disturbances must be aggressively addressed in this population with frequent screening, follow-up, and treatment.

CLINICAL PRESENTATION

A 48-year-old man with dextrotranspostion of the great arteries (d-TGA) and atrial switch procedure (Mustard) presented with palpitations. He had a history of atrial arrhythmias and underwent an attempted ablation at another hospital. The ablation was not completed because his presumed atrial tachycardia was in proximity to the atrioventricular (AV) node, he had a pacemaker placed with atrial antitachycardia pacing technology, and he was started on antiarrhythmic medications. However, given continued daily symptoms despite medications, and a decline in systemic ventricular function caused by incessant tachycardia, he was referred to our institution for evaluation and ablation.

CLINICAL COURSE

The patient presented to the electrophysiology (EP) laboratory in supraventricular tachycardia (SVT). Venous access was obtained and a standard EP study was performed. A decapolar catheter was advanced through the patient's Mustard baffle and placed into the left atrial appendage. A quadripolar catheter was advanced through the baffle, across the nonsystemic AV valve (mitral valve), and into the subpulmonary left ventricle. The patient was in an incessant A-on-V tachycardia at a cycle length of 430 milliseconds.

At baseline, the patient's A-on-V SVT had intermittent spontaneous AV block (Fig. 1), thus ruling out AV reciprocating tachycardia. Ventricular overdrive pacing accelerated the tachycardia and,

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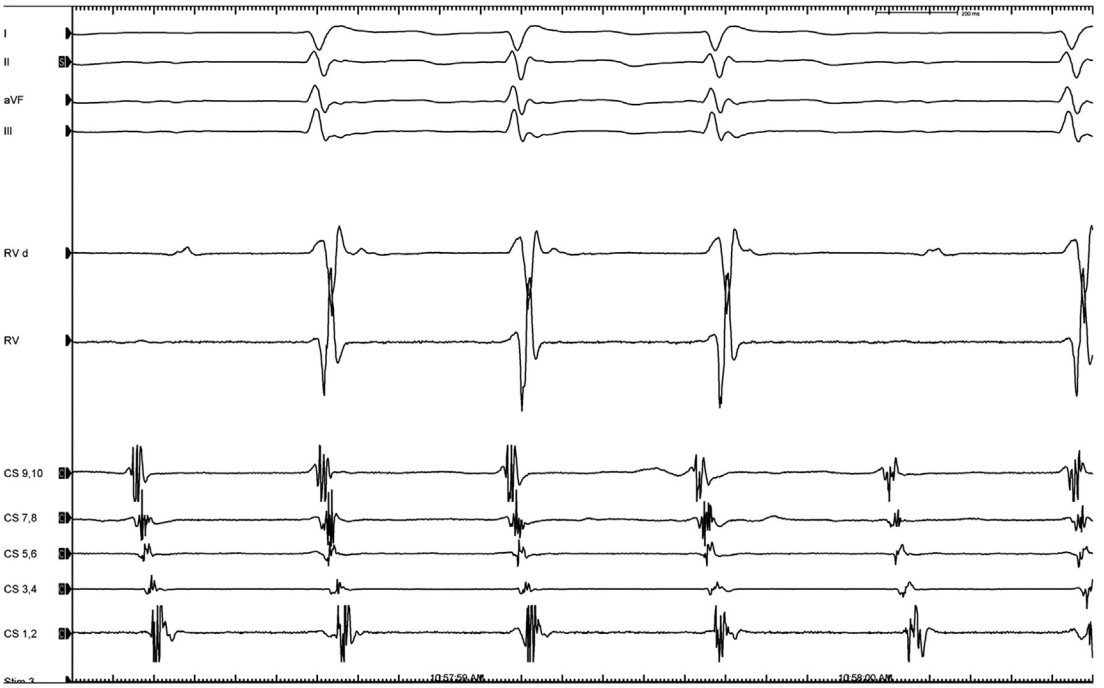

Fig. 1. At baseline, the patient was in an A-on-V tachycardia with intermittent spontaneous AV block, thus ruling out AV reciprocating tachycardia.

after cessation, showed a V-A-V response (Fig. 2), thus ruling out atrial tachycardia. The postpacing interval minus tachycardia cycle length and the Stim-A minus VA were long, and both were consistent with typical slow-fast AV nodal reentrant tachycardia (AVNRT) (Fig. 3).

CLINICAL QUESTION

How can the slow pathway for AVNRT be modified in patients with d-TGA who have had an atrial switch procedure?

MANAGEMENT AND ABLATION

The His electrogram could not be located within the baffle and good A/V electrogram ratios for slow pathway modification were not possible from within the baffle. Femoral arterial access was obtained, and a standard 4-mm tip radiofrequency ablation catheter was advanced around the aortic arch. The catheter was prolapsed retrograde across the aortic valve into the systemic right ventricle (RV), and then retroflexed through the systemic AV valve (tricuspid valve) annulus. Atrial overdrive pacing accelerated the ventricular electrograms and, after cessation, showed an A-H-A response, consistent with typical slow-fast AVNRT and ruling out junctional tachycardia.

Electroanatomic mapping was performed to define a His cloud. Preprocedure imaging with a computed tomography (CT) scan had defined the patient's anatomy. This imaging was merged with the electroanatomic map to create an image of the tricuspid valve, aorta, and septum, in order to better delineate the slow pathway region for ablation (Fig. 4). The ablation catheter was lowered to the inferior portion of the AV annulus, well below the His cloud. The fast pathway was mapped away from this region, and was closer to the His cloud.

A large ventricular and small atrial electrogram was present, and ablation in this region repeatedly initiated SVT (see Fig. 4, red lesion tags). Because we could not safely assess ablation efficacy or impending heart block because of tachycardia initiation with ablation, we decided to change to cryoablation. The 4-mm tip radiofrequency ablation catheter was removed. A 5-French pigtail catheter was used to guide a long 8.5-French SL0 sheath across the aortic valve and into the systemic RV. A 4-mm tip cryoablation catheter was placed through the long sheath and retroflexed toward the slow pathway region where the prior radiofrequency lesions were attempted (Fig. 5, white arrow). Several cryoablations were applied, without causing initiation of tachycardia during ablation. However, the tachycardia