Intra-atrial Reentrant Tachycardia in Complete Transposition of the Great Arteries Without Femoral Venous Access

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KEYWORDS

• d-TGA • Atrial flutter • Catheter ablation • Hepatic venous access

KEY POINTS

- Catheter ablation for patients with transposition of the great arteries (d-TGA) requires multiple considerations and careful preprocedural planning.
- Knowledge of the patient's anatomy and surgical correction, in addition to electroanatomic mapping and entrainment maneuvers, are important to identify and successfully treat arrhythmias.
- This case was unique in that the lack of femoral venous access required transhepatic venous access and bidirectional block was attained with ablation lesions along the cavotricuspid isthmus on both sides of the baffle.

CLINICAL PRESENTATION

A 49-year-old woman with history of transposition of the great arteries (d-TGA) presented with recurrent episodes of drug-refractory, symptomatic atrial flutter. Her history was notable for surgical atrial septostomy via a right lateral thoracotomy (Blalock-Hanlon septectomy) and a surgical atrial switch (Mustard) procedure at the age of 6 years. In addition, she had a baffle leak and underwent closure with a percutaneous Amplatzer atrial septal occluder device (St Jude Medical, St Paul, MN). She has known bilateral femoral vein occlusions. She was referred for catheter ablation.

CLINICAL QUESTION

What is the approach to catheter ablation for intra-atrial reentrant tachycardia (IART) in a patient with d-TGA?

CLINICAL COURSE

The initial approach to IART in this patient is similar for any patient with atrial flutter. Using entrainment and activation mapping, we identified the circuit involved and the critical isthmus that was required to maintain the IART. Once the circuit was identified, we then considered the specific challenges for this patient, which included her atrial baffle and the lack of femoral venous access.

The patient was brought to the electrophysiology (EP) laboratory, where access was obtained in the right internal jugular vein and the right common femoral artery. A standard EP study was performed. Incremental right atrial pacing induced tachycardia with a cycle length of 290 milliseconds. Entrainment from the systemic venous side of the cavotricuspid isthmus (CTI) showed a post-pacing interval (PPI) minus tachycardia cycle length (TCL) of 21 milliseconds, indicating that

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the systemic venous CTI was integral to the arrhythmia circuit (Fig. 1A). Entrainment from the left atrium established that it was not part of the circuit (see Fig. 1B). The catheter was moved to the anterior portion of the systemic venous atrium (toward the tricuspid valve) and entrainment showed that it was part of the circuit (see Fig. 1C). Given the lack of catheter stability from a superior approach, a high suspicion for CTI-dependent IART, and the presence of a significant amount of the CTI on the systemic venous side of the baffle, percutaneous transhepatic venous access was obtained with ultrasonography guidance. An 8.5-French long sheath was placed into the inferior vena cava (IVC) via a hepatic vein before heparin administration for arterial catheter placement (Fig. 2).

Access to the tricuspid valve, or the systemic atrioventricular (AV) valve, was performed via a retrograde aortic approach. Entrainment from the pulmonary venous medial and lateral CTI confirmed that the PPI-TCL was less than 30 milliseconds (see Fig. 1D). Activation mapping revealed a counterclockwise IART circuit encompassing the full TCL around the tricuspid valve annulus (Fig. 3).

Given that the critical isthmus was confirmed to be the CTI for an IART circuit around the systemic AV valve (tricuspid valve), ablation targeted the CTI using an irrigated tip catheter. On the systemic venous side, via the transhepatic access, a series of ablation lesions were delivered in a linear fashion to create a line of block from the baffle along the CTI to the IVC (see Fig. 3, *red lesion tags*). IART terminated during ablation along the systemic venous side of the CTI, but bidirectional block was not achieved. Next, the ablation catheter was advanced via a retrograde aortic approach, prolapsed across the aortic valve, and into the systemic right ventricle. The ablation catheter was then advanced into the pulmonary venous atrium, and ablation was performed on that side of the CTI. Bidirectional block was confirmed and persisted after a waiting period. No other arrhythmias were inducible. The hepatic access was occluded with coil embolization to prevent bleeding from the tract. The patient has remained arrhythmia free over a 3-year follow-up period.

DISCUSSION

d-TGA accounts for 5% to 7% of congenital heart defects, with most adults now having had a Mustard or Senning procedure. These surgeries involve extensive atrial reconstruction and predispose to both sinus node dysfunction and atrial tachyarrhythmias. Up to 25% of patients have atrial tachyarrhythmias (IART being the most

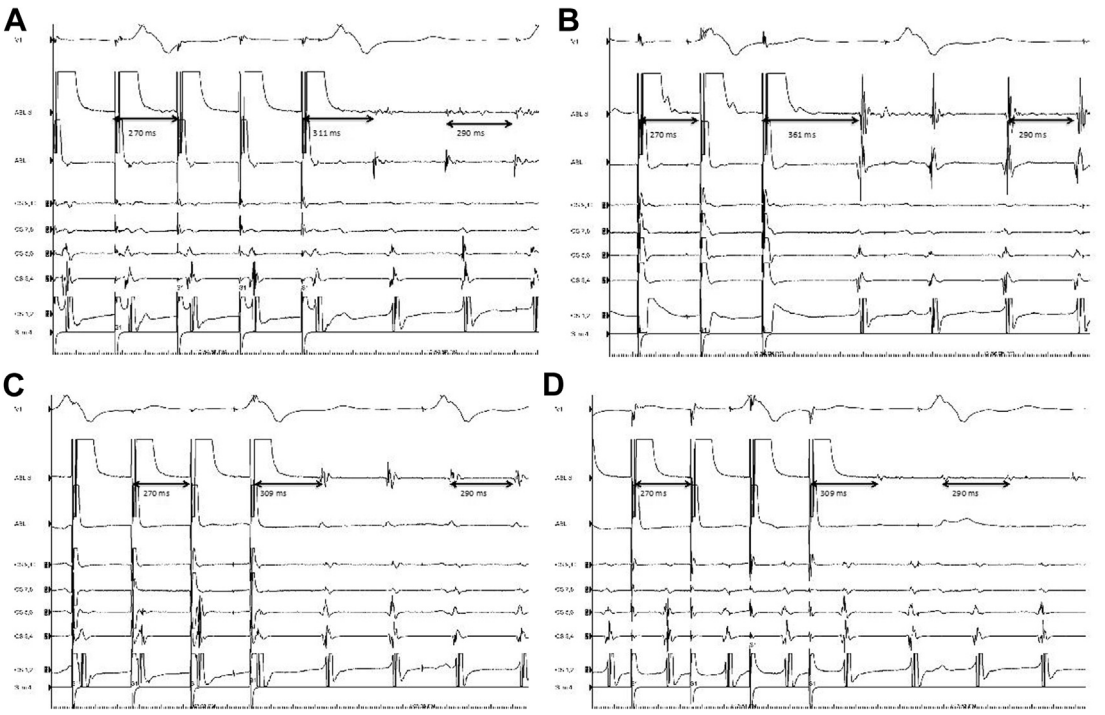

Fig. 1. Entrainment pacing performed in (*A*) venous portion of the CTI, (*B*) left atrium, (*C*) anterior baffle of the systemic venous CTI, (*D*) arterial portion of the CTI from a retrograde aortic approach.