Successful slow pathway ablation for atrioventricular nodal re-entrant tachycardia via a hypoplastic inferior vena cava in a patient with an azygos continuation

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Catheter ablation of the slow pathway for atrioventricular nodal re-entrant tachycardia (AVNRT) is not always possible due to congenital or acquired obstruction of the inferior vena cava (IVC). Although a superior access has been proposed as an alternative approach, a poor manoeuvrability and a lower stability of the ablation catheter may be potential problems. We report a case of slow pathway ablation for AVNRT in a patient with an azygos continuation using a hypoplastic but uninterrupted IVC.

Keywords Hypoplastic inferior vena cava; Azygos continuation; AV nodal re-entrant tachycardia; Catheter ablation

In order to ablate the slow pathway for atrioventricular nodal re-entrant tachycardia (AVNRT), the catheters normally access the heart through the transfemoral route. Unfortunately, this is not always possible because of obstruction of the inferior vena cava (IVC). The congenital absence of the hepatic segment of the inferior IVC is an anatomical variant that may occur in 0.1–0.6% of normal healthy individuals and up to 3% of patients with congenital heart disease.1–5 We report a case of slow pathway ablation in a patient with an azygos continuation using a hypoplastic but uninterrupted IVC.

A 39-year-old woman with a medically refractory history of supraventricular tachycardia in the absence of structural heart disease was admitted for an ablation procedure. Two 5 F quadrapolar catheters were advanced through the right femoral vein. When the first reached the cardiac silhouette, no electrical activity could be recorded nor could the catheter be advanced into the right atrium (RA). An angiography showed the contrast material entering the RA through the superior vena cava, suggesting the interruption of the IVC and the continuation of the azygos (Figure 1A and B). As a consequence, the electrode was positioned through the azygos vein into the RA. However, when the second quadrapolar electrode was advanced, the RA and the His-bundle area were reached without encountering any obstacle, suggesting the permeability of the IVC. A pigtail diagnostic catheter was used to perform an angiography at the azygos vein to corroborate the diagnosis, showing also that the second catheter had accessed the RA through an alternative vessel (Figure 1C and D).

With the catheters positioned in the low RA (through the azygos vein) and the His bundle (through the hypoplastic IVC), a programmed electrical stimulation was performed and a supraventricular tachycardia compatible with AVNRT was reproducibly induced.

A 4 mm standard radio frequency ablation catheter (Mariner, Medtronic Inc., MN, USA) was successfully advanced through the hypoplastic IVC using the second quadrapolar catheter as an X-ray guide. The diagnostic catheter was then advanced to the right ventricular apex, and the tip of the ablation catheter was positioned in the posterior portion of the triangle of Koch where radiofrequency current was administered (Figure 1 G-H).

At the end of the procedure, a multipurpose catheter (MP-2, Medtronic Inc.) was used to inject contrast material into the vessel where the ablation catheter had been advanced, confirming the diagnosis of uninterrupted IVC (Figure 1E and F). There were no complications.

The internal right jugular and subclavian veins have been proposed as an alternative approach for the ablation of the slow pathway in the case of infrahepatic obstruction of the IVC. However, the potential drawbacks of a superior access could be the orientation and poor manoeuvrability of the ablation catheter and lower catheter stability, which are essential to avoid complications such as complete AV block.

In our patient, the manipulation of the diagnostic catheter through the azygos continuation of the IVC was difficult and time-consuming, because of its long course and angulation. Fortunately, after advancing one of the quadrapolar catheters through an unsuspected hypoplastic IVC, the ablation catheter was safely positioned through the same vessel, allowing a much finer control of its tip and the successful ablation of the slow AV nodal pathway.

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This case report highlights the importance of identifying this type of vascular anomaly and, in particular, of recognizing the existence of a permeable IVC, which allows for the safer ablation of the slow AV nodal pathway.

Conflict of interest: none declared.

References