

EP CASE REPORT

Twin atrioventricular nodes in congenitally corrected transposition of the great arteries: who is the ringleader of the atrioventricular nodal re-entrant tachycardia?

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Twin atrioventricular nodes (AVNs) can be confirmed in several patients with congenitally corrected transposition of the great arteries (C-TGA). However, the detailed electrophysiological properties of atrioventricular nodal re-entrant tachycardia (AVNRT) with twin AVNs in C-TGA patients have not been fully characterized.

A 19-year-old man with previously diagnosed C-TGA (S-L-L type, Figure 1A) was referred with a 20-month history of frequent episodes of palpitations and chest tightness. The electrocardiogram during clinical symptoms revealed a regular QRS complex tachycardia with a cycle length of 320 ms. Two quadripolar catheters (Supreme, JSN, St. Jude Medical) were advanced into the high right atrium and right ventricle, respectively. A decapolar catheter (Inquiry, St. Jude Medical) was inserted inside the coronary sinus, while the ablation catheter (Thermocool, Biosense Webster, Diamond Bar, CA, USA) was introduced through a long sheath in the His-bundle region. Typical AVNRT was diagnosed based on the presence of 'AH' jump and echo beat initiating tachycardia with short RP interval ($VA < 70\text{ms}$), then validated by ventricular overdrive pacing. Detailed three-dimensional electroanatomic mapping was performed during AVNRT and sinus rhythm (SR), respectively. As shown in Figure 1B and C, two distinctive His-bundle (HB) potentials with different HV intervals (55 ms at the anterior HB and 32 ms at the posterior HB) during AVNRT were identified at the upper and lower margins of the 'ventricular septal defect', indicating that two distinct twin AVNs with a connecting sling might be involved in the tachycardia (Figure 1D). The same HV intervals of the twin AVNs then were verified under SR (Figure 1E). The HV interval at the anterior AVN-HB during AVNRT was equal to that of the SR ($HV_{AVNRT} = HV_{SR}$). Hence, we inferred that the upper AVN was the ringleader of the AVNRT. Radiofrequency with a target temperature of 55°C and maximum power output of 30 W was applied successfully below the anterior AVN-HB under SR with intermittent junctional rhythm rendered the tachycardia not inducible and without recurrence for more than 20 months.

Radiofrequency ablation of the AVNRT in C-TGA patients with twin AVNs remains a notable challenge to the electrophysiologist due to multiple morphological abnormalities and complex electrical conduction.^{1,2} The two distinct AVNs should be checked and located by detailed mapping, and HV intervals of the two AVNs during AVNRT should be compared; if one of the AVN-HV intervals is approximately equal to the HV of SR ($HV_{AVNRT} = HV_{SR}$), it highly suggests that the related slow pathway of the targeted AVN is the ringleader of tachycardia.



Figure 1 Anatomic relationship between C-TGA and VSD by three-dimensional computed tomography reconstruction (A); and electroanatomic mapping of AVNRT (B and C); diagrammatic representation of the general AVN-His-Purkinje system (D); Note that the HV of the posterior AVN-HB during AVNRT was behind that of the anterior AVN-HB (white dotted arrows), which was equal to that of SR (E). AO, aorta; AVNRT, atrioventricular nodal re-entrant tachycardia; LV, left ventricle; MV, mitral valve; PA, pulmonary artery; PV, pulmonary valve; RV, right ventricle; VSD, ventricular septal defect.

Conflict of interest: none declared.

References

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