

EP CASE REPORT

Cycle length alternans during an atypical atrioventricular nodal re-entrant tachycardia utilizing a superior slow pathway

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A 71-year-old man underwent electrophysiological testing for a supraventricular tachycardia (SVT) with cycle length (CL) alternans (Figure 1A). At baseline, there was no pre-excitation, with normal atrio-Hisian (AH) and His-ventricular intervals. Two discontinuities in the

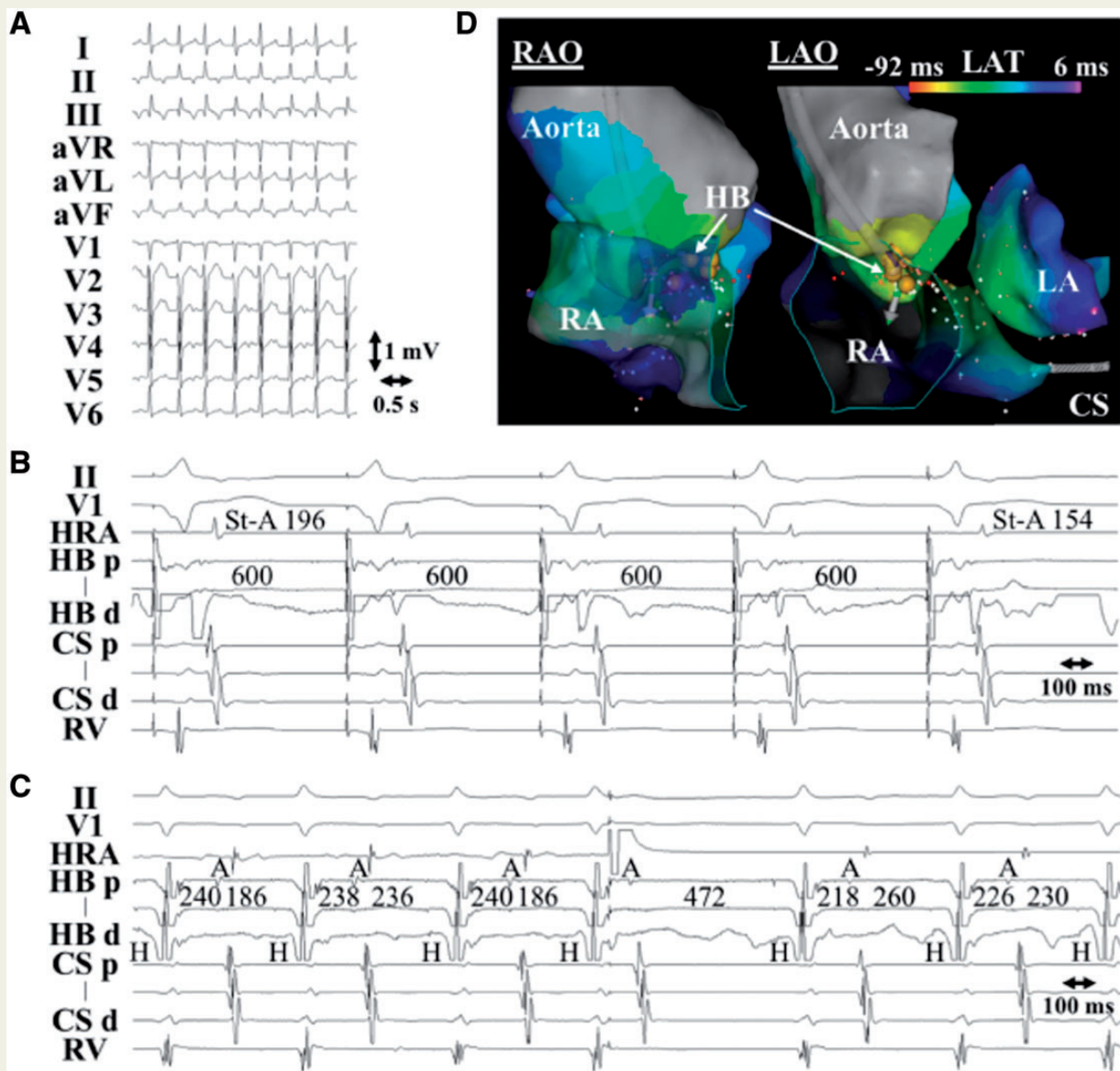


Figure 1 Twelve-lead electrocardiogram of the supraventricular tachycardia (SVT) (A), the response to para-Hisian pacing (B) and an atrial premature depolarization during the SVT (C), and activator map of the atrial activation during ventricular pacing exhibiting the successful ablation site (D). CS, coronary sinus; HB, His bundle; HRA, high right atrium; LA, left atrium; LAT, local activation time; RA, right atrium; RV, right ventricle; St-A, Stimulus-to-atrial; X d(p), the distal (proximal) electrode pair of the relevant catheter.

anterograde atrioventricular conduction curve were observed, suggesting the presence of two slow pathways (SPs). Ventriculoatrial conduction was concentric and decremental, with a long ventriculoatrial interval, and para-Hisian pacing showed a nodal pattern (*Figure 1B*). Atrial extra-stimulation revealed a sudden prolongation of the AH interval, followed by an SVT with alterations in short and long AH intervals and long His-atrial (HA) intervals with an atrial activation sequence identical to that during para-Hisian pacing. During the SVT, an introduced atrial premature depolarization resulted in a switch to anterograde typical SP conduction with prolongation of the AH interval and shortening of the subsequent HA interval (as a result of decremental conduction properties of the superior SP) with the same atrial activation sequence as that of the SVT (*Figure 1C*). These findings suggested that the SVT should be an atrioventricular nodal re-entrant tachycardia (AVNRT) with not only alterations in anterograde fast pathway (FP) and typical SP conduction but also retrograde superior SP conduction.

Cycle length alternans during a typical AVNRT using an FP as the retrograde limb can occur due to anterograde conduction via two typical SPs.¹ Although superior SPs can serve as the retrograde limb in fast/slow and slow/slow AVNRTs,² CL alternans during such atypical AVNRTs has not been reported. Our case is the first report demonstrating that a superior SP could be utilized as the retrograde limb during an atypical AVNRT exhibiting CL alternans due to anterograde conduction via an FP and typical SP. After the tachycardia terminated, activation mapping during ventricular pacing was performed with CARTO3 system (Biosense Webster, Diamond Bar, CA, USA), revealing the earliest atrial activation at the right atrial antero-septum where the His bundle (HB) electrogram was recorded during sinus rhythm. Using radiofrequency energy delivered from ThermoCool SmartTouch SF catheter (Biosense Webster) in the power control mode at 35 W with an irrigation flow rate of 15 mL/min and a temperature limit of 41°C, the superior SP was successfully ablated within the non-coronary cusp without FP injury, where the HB electrogram was not recorded during sinus rhythm (*Figure 1D*). Thereafter, ventriculoatrial conduction was abolished, and no tachycardia was inducible by any pacing manoeuvres.

References

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