


# Tachycardia cycle length alternans during a narrow QRS complex tachycardia with eccentric retrograde atrial activation sequence: What is the mechanism?

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## 1 | EPS FOR RESIDENT PHYSICIANS

Differential diagnoses of regularly irregular narrow QRS tachycardias are atrioventricular (AV) re-entrant tachycardia (AVRT) with alternating antegrade atrioventricular node (AVN) pathways, atypical AV nodal re-entrant tachycardia (AVNRT) with alternating antegrade AVN pathways, and atrial tachycardia (AT) with alternating antegrade AVN pathways or with Wenckebach periodicity.<sup>1</sup> A 32-year-old man underwent radiofrequency catheter ablation of narrow QRS tachycardia (NQRST). A 12-lead ECG showed the periodic change in the PR interval with the same RP interval and the PP interval depending on the preceding RR interval. The ventriculoatrial (VA) linking with a single P wave morphology eliminates the possibility of an AT.<sup>1</sup> If the retrograde conduction is through the AV node, the RP interval would change after sudden prolongation of PR and in fact it stays constant, which is more consistent with retrograde conduction over an accessory pathway. These findings have been verified subsequently on electrophysiological study (Figure 1). Programmed atrial stimulation study demonstrated dual AV nodal physiology, and an eccentric and nondecremental VA conduction detected during the programmed ventricular stimulation. Programmed atrial stimulation easily and reproducibly induced a NQRST with spontaneous alternation of tachycardia CL following an AH jump. The earliest retrograde

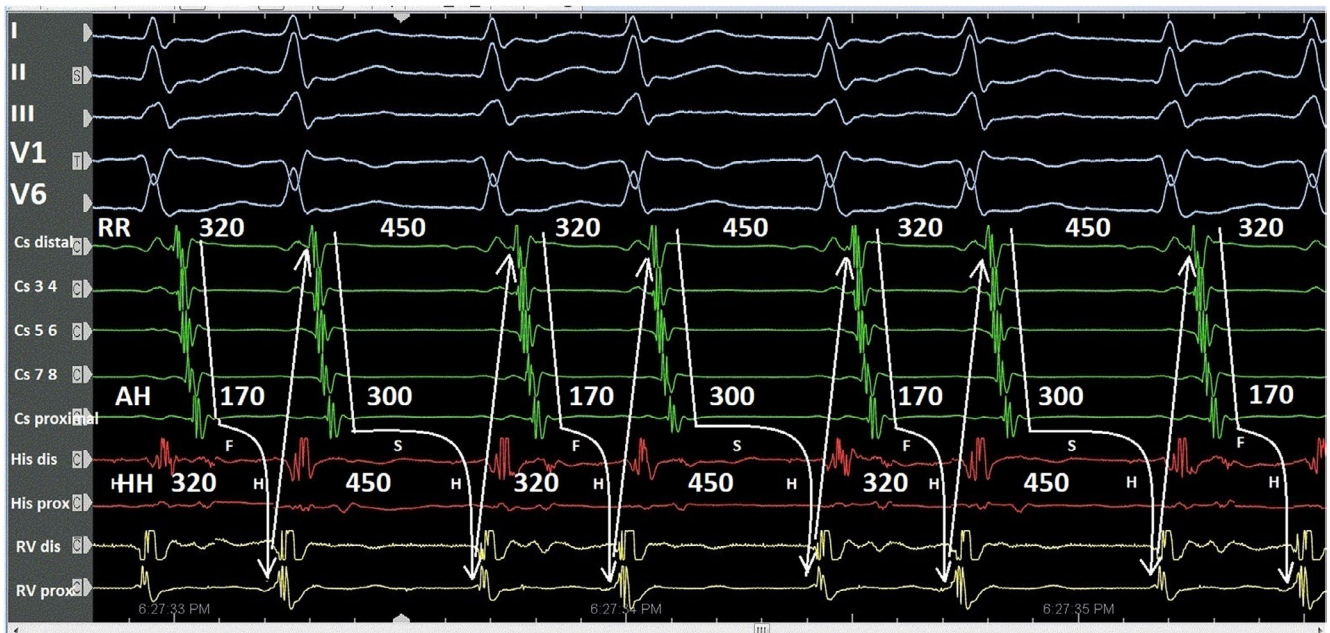
atrial activation is recorded at the coronary sinus (CS) distal dipole, which is placed at the CS distal region. However, eccentric CS activation is observed exclusively during atypical AVNRT in 5% of all patients with AVNRT.<sup>2</sup> An alternative explanation for eccentric retrograde atrial activation during AVNRT is the presence of a bystander left-sided accessory pathway. Therefore, the presence of eccentric activation does not definitively rule out AVNRT, other maneuvers are required to establish a diagnosis.<sup>3</sup> Although the presence of dual AV nodal pathways and initiation of the tachycardia by AH jump favor AVNRT, it has also possible finding in patients with AVRT. The differential ventricular pacing, at the same pacing CL, showed shorter Stim-A and local VA intervals during LV pacing compared with that during RV pacing.<sup>4</sup> Stimulus to atrial interval-VA tachycardia (SA-VA) interval of 30 msec was consistent with AVRT than AVNRT.<sup>3</sup> It is possible to transit from AVRT to AVNRT in the presence of dual AV nodal physiology, and unrecognized second tachycardia may diagnosed as a recurrence despite successful ablation of first tachycardia.<sup>5</sup> However, a left lateral accessory pathway ablation was performed, and eventually, no tachycardia was any longer seen or inducible in this patient. There was VA dissociation after adenosine administration during ventricular pacing. We confirmed the case as an orthodromic AVRT involving left lateral accessory pathway with anterograde conduction alternating between slow and fast AV nodal pathways (Figure 2).

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**FIGURE 1** Electrogram shows a narrow QRS tachycardia with RR alternans because of the orthodromic AVRT involving left lateral accessory pathway with anterograde conduction alternating between slow and fast AV nodal pathways



**FIGURE 2** Electrogram shows a narrow QRS tachycardia with RR alternans because of the orthodromic AVRT involving left lateral accessory pathway with anterograde conduction alternating between slow (S) and fast (F) AV nodal pathways. H, His

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