

## SPOTLIGHT

# Response to spontaneous and induced His refractory ventricular premature beats during long RP tachycardia: What is the mechanism?

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**Keywords:** His refractory VPB, long RP tachycardia, permanent junctional reciprocating tachycardia, postexcitation

A 43-year-old lady with no evidence of structural heart disease underwent an electrophysiological study for the evaluation of recurrent episodes of palpitation. A narrow complex regular tachycardia was documented at an outside facility that did not respond to 12 mg of intravenous adenosine administered through the right cubital vein. ECG of adenosine response was not available. There was no basal preexcitation. The AH and HV intervals during sinus rhythm were 70 and 48 ms, respectively. A regular narrow complex long RP tachycardia with concentric atrial activation was induced, which was incessant in nature. Ventricular overdrive pacing from right ventricular (RV) septum during tachycardia at 20 ms shorter than tachycardia cycle length showed pseudo-V-A-A-V response with VA linking on cessation of pacing. His refractory ventricular premature beat (VPB) was delivered during the tachycardia (Figure 1). A spontaneous catheter-induced VPB was noted after 2 beats. What are the observations and mechanisms?

The differential diagnosis for the long RP tachycardia with 1:1 AV relationship includes an orthodromic atrioventricular reentry (ORT) through a retrograde only decrementally conducting accessory pathway, atrial tachycardia and atypical atrioventricular nodal reentrant tachycardia and ORT with nodoventricular/nodofascicular accessory pathway (NV/NF-AP). The VA intervals before and after the VPB are same, which suggests VA linking and, therefore, the diagnosis of atrial tachycardia is less likely (which also correlated with the pseudo-V-A-A-V response on ventricular entrainment). An ORT via NV/VF-AP was less likely as the AH during tachycardia was 72 ms ( $AH < 40$  ms favors nodofascicular reentrant tachycardia/nodoventricular reentrant tachycardia mediated ORT) and is not lesser than during sinus rhythm. Delta AH interval ( $AH_{\text{entrainment/pacing at TCL}} - AH_{\text{SVT}}$ ) is

$< 40$  ms.<sup>1,2</sup> The resetting of tachycardia with identical atrial activation sequences pre- and post-VPB suggests the presence of a retrograde accessory pathway and confirms its participation in tachycardia. Induction of His-refractory VPB during tachycardia with a coupling interval of 272 ms resulted in postexcitation of atrial signal, and this suggests a decrementing nature of the retrograde limb of the tachycardia circuit. The second VPB in the tracing, likely catheter-induced from the same site as the induced one, also showed postexcitation of the atrial impulse. This catheter-induced VPB had a narrower morphology, suggesting engagement of the septum or conduction system and a longer coupling interval of 302 ms. The magnitude of the postexcitation was higher (26 ms) during the induced VPB compared to the catheter-induced VPB of (14 ms). The varying degrees of postexcitation can be explained by the distance from the VPB origin to the site of the ventricular end of the insertion of the accessory pathway and the coupling interval. The morphology of the VPB being narrow but similar to the paced beat makes different location due to catheter movement as a cause for incremental postexcitation less likely. Hence, the degree of postexcitation in the decrementally conducting retrograde limb of the tachycardia circuit is likely related to the coupling intervals of the VPB. Postexcitation will be higher when the VPB coupling interval is shorter. This phenomenon reiterates the decremental nature of the retrograde limb of the tachycardia circuit. In this case, successful radiofrequency ablation of the decrementally conducting accessory pathway was done outside the coronary sinus ostium with no inducible tachycardia thereafter.

This electrophysiology tracing demonstrates an interesting, graded response of decrementally conducting retrograde limb of

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**FIGURE 1** The figure represents surface electrogram (I, II, III, aVR, aVL, aVF, V1-V6) and intracardiac electrograms (His d, His p, CS 9,10, CS7,8, CS5,6, CS3,4, CS1,2, and RV catheter at distal right ventricular outflow septum RVd, RV p) showing the response of long RP tachycardia to His refractory VPB and spontaneous catheter-induced VPB. RV, right ventricular; VPB, ventricular premature beat.

orthodromic reentrant tachycardia circuit with varying coupling intervals of His-refractory VPB.

#### CONFLICT OF INTEREST STATEMENT

Authors declare no conflict of interests for this article.

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**How to cite this article:** Kakarla S, Abhilash SP, Vijay J, Namboodiri N. Response to spontaneous and induced His refractory ventricular premature beats during long RP tachycardia: What is the mechanism? *J Arrhythmia.* 2024;40:148–149. <https://doi.org/10.1002/joa3.12958>