

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

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Abstract

CLINICAL PROBLEM: A 43-year-old lady with no evidence of structural heart disease underwent an electrophysiological study for the evaluation of recurrent episodes of palpitations. A narrow complex regular tachycardia was documented, which was not reverted with intravenous adenosine administration. There was no basal pre-excitation. The AH and HV intervals during sinus rhythm were 70ms and 48ms respectively. A regular narrow complex long RP tachycardia with concentric atrial activation was induced which was incessant in nature. Ventricular overdrive pacing from RV septum during tachycardia at 20 ms earlier than tachycardia cycle length showed pseudo-V-A-A-V response with VA linking on cessation of pacing. A 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?

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CLINICAL PROBLEM:

A 43-year-old lady with no evidence of structural heart disease underwent an electrophysiological study for the evaluation of recurrent episodes of palpitations. A narrow complex regular tachycardia was documented, which was not reverted with intravenous adenosine administration. There was no basal pre-excitation. The AH and HV intervals during sinus rhythm were 70ms and 48ms respectively. A regular narrow complex long RP tachycardia with concentric atrial activation was induced which was incessant in nature. Ventricular overdrive pacing from RV septum during tachycardia at 20 ms earlier than tachycardia cycle length showed pseudo-V-A-A-V response with VA linking on cessation of pacing. A 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?

COMMENTARY:

The differential diagnosis for the long RP tachycardia with a 1:1 AV relationship includes a permanent form of junctional reciprocating tachycardia, atrial tachycardia and atypical atrioventricular nodal re-entrant tachycardia (AVNRT). The VA intervals prior and to 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). The resetting of tachycardia with identical atrial activation sequences pre- and post-VPB suggests the presence of a retrograde accessory pathway and evidences its participation in tachycardia. Induction of His refractory VPB during tachycardia with a coupling interval of 272 ms resulted in post-excitation of atrial signal and 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 but shows narrower morphology suggesting engagement of the septum or conduction system but with a longer coupling interval of 302ms, also showed post-excitation of the atrial impulse. The magnitude of the post-excitation is higher (26ms) during the induced VPB rather than the catheter-induced VPB of (14ms). The varying degree of post-excitation can be explained by the distance from the VPC origin to the site of the ventricular end of insertion of the accessory pathway and the coupling interval. The morphology of the VPB being narrow but similar to the paced beat makes this as a cause for incremental post-excitation less likely. Hence the degree of post-excitation in the decrementally conducting retrograde limb of the tachycardia circuit is most probably related to the coupling intervals of the VPB. Post-excitation will be higher when the VPB coupling interval is shorter. This phenomenon re-iterates the decremental nature of the retrograde limb of the tachycardia circuit further confirming the diagnosis of permanent form of junctional reciprocating tachycardia (PJRT).

In this case, successful radiofrequency ablation of the decrementally conducting accessory pathway was done outside the coronary sinus ostium with no inducible tachycardia thereafter.

CONCLUSION:

This electrophysiology tracing demonstrates an interesting, graded response of decremental conduction of PJRT circuit with varying coupling intervals of His-refractory VPB.

FIGURE LEGENDS:

Fig.1 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 RVOT septum RVd, RV p) showing the response of long RP tachycardia to His refractory VPC and spontaneous catheter induced VPB.

