


Unusual ventricular entrainment response: What is the mechanism?

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Abstract

Entrainment is an important tool for the diagnosis and location of reentry. The usefulness of this maneuver requires that, prior to cessation of ventricular pacing, the atrial rate accelerates to the ventricular pacing rate. Moreover, it is important to verify the continuation of the tachycardia following cessation of entrainment. The recognizing the last entrained atrial beat is utmost important to avoid erroneous A-A-V labeling.

KEYWORDS

atrioventricular nodal reentrant tachycardia, ventricular entrainment

1 | EPS FOR RESIDENT PHYSICIANS

A 38-year-old female with a history of narrow complex tachycardia (NQT) was referred for electrophysiology study and radiofrequency ablation. Her resting 12-lead electrocardiogram and transthoracic echocardiogram were normal. Multi-electrode catheters were placed in the coronary sinus, His bundle region, and right ventricular outflow tract. During an electrophysiological study, a sustained NQT with a cycle length (CL) of 300 ms with a long ventricular-atrial (VA) interval was induced. Parahisian right ventricular entrainment was performed and the following result was obtained (Figure 1). What is the mechanism?

2 | DISCUSSION

The three principal causes of the NQT are atrial tachycardia (AT), orthodromic atrioventricular reentrant tachycardia (AVRT), and atrioventricular nodal reentrant tachycardia (AVNRT). However, the NQT with VA dissociation and/or block is rare but quite challenging. The differential diagnosis of it include junctional tachycardia (JT) with junctional-atrial block; AVNRT with block in the upper common pathway, orthodromic nodofascicular/nodoventricular reentry (NFRT/NVRT) with nodal-atrial block, and intrahisian reentrant tachycardia with His-atrial (HA) block.^{1,2} Therefore, the differential diagnosis of long-RP tachycardias frequently presents a

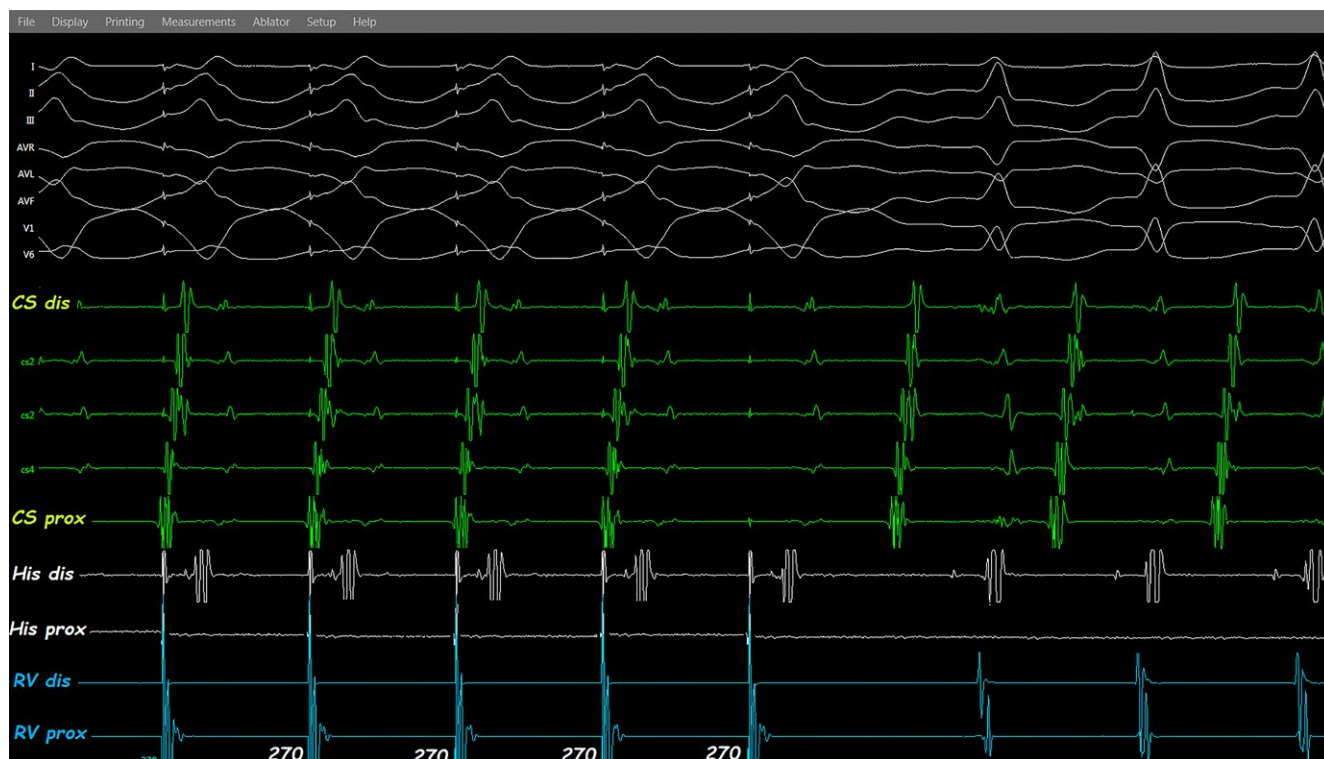


FIGURE 1 Tachycardia response to right ventricular entrainment

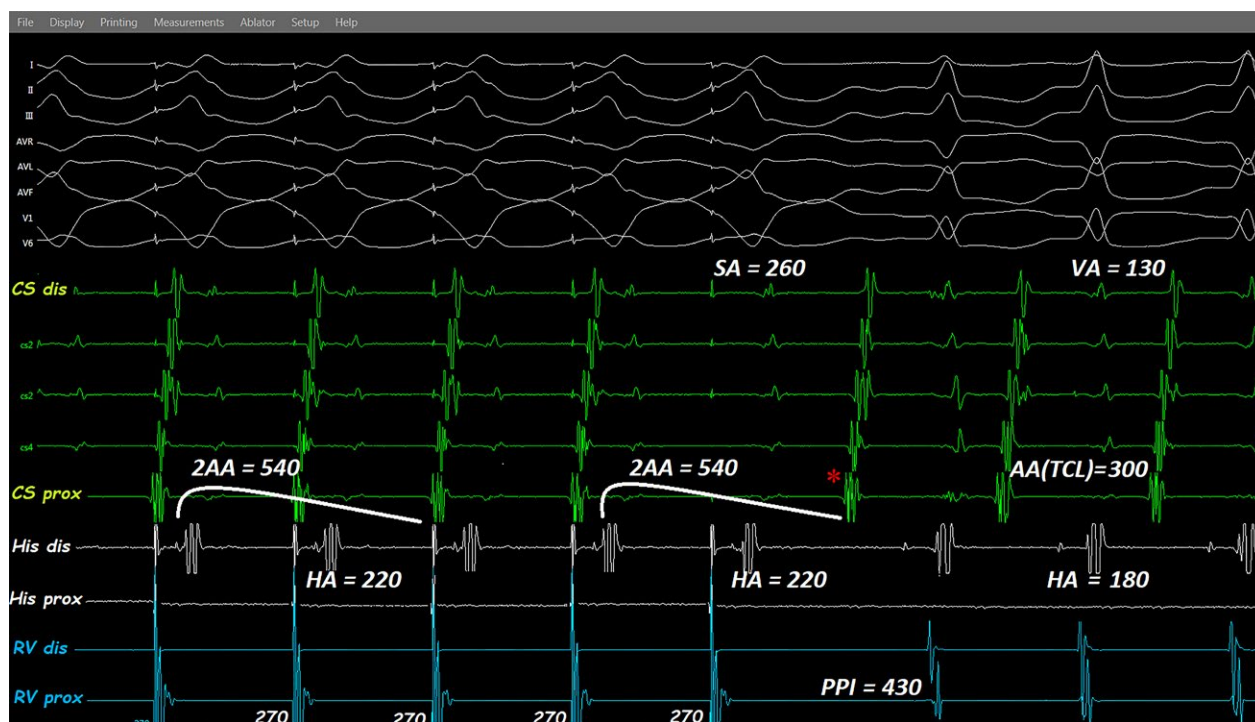


FIGURE 2 The asterisks identifies the last entrained atrial EGM sequence despite the dropped previous atrial EGM during ventricular entrainment. HA, His to atrial; PPI, post pacing interval; SA, stimulus-A; TCL, tachycardia cycles interval; VA, ventriculo-atrial

difficult challenge for the physician, requiring a complex electrophysiologic workup.

In present case, since the JT is unlikely by the method of induction and the slight irregularity, the reproducible tachycardia

induction with programmed atrial stimulation excluded JT. There was no splitting of the His potential to suggest longitudinal dissociation which excludes intra-Hisian reentry. Entrainment is an important tool for the diagnosis and location of reentry.³ The

usefulness of this maneuver requires that, prior to cessation of ventricular pacing, the atrial rate accelerates to the ventricular pacing rate. Moreover, it is important to verify the continuation of the tachycardia following cessation of entrainment. The recognizing the last entrained atrial beat is utmost important to avoid erroneous A–A–V labeling. In present case, at first glance, a confusing response to ventricular entrainment seen since the misidentification of the last entrained atrial beat could lead to misinterpretation (Figure 1). The last entrained atrial beat (* at Figure 2) was in fact the last one following one cycle momentary VA block, as is illustrated in Figure 2. A single blocked V toward the end does not impact on the result. It is a clear that a 'VAV' result and rules out AT, provided this is not a coincidence. Since the VA block occurred during the ventricular pacing; it is difficult to exclude the termination of an AT originating from the Koch's triangle region by overdrive ventricular pacing (with VA conduction) and an incidental occurrence of the AT upon cession of the pacing. The next and last V beat may just as well have restarted the tachycardia after it was terminated, however, this is a hypothetical (impossible or very unlikely) condition for AT. This leaves only AVRT, AVNRT, and the much less commonly observed NV/NF reentry. All entrainment criteria (postpacing interval [PPI], 130 ms; Δ SA–VA, 130 ms; and Δ HA, 40 ms) yield a diagnosis of atypical AVNRT but indeed all of these results do not exclude NV/NF participation⁴ or decremental accessory pathways His-refractory premature ventricular contraction (PVC) has been found the only maneuver to identify a bystander, concealed NF pathway during atypical AVNRT.⁴ The HA during pacing is longer than the HA during tachycardia, a finding consistent with AVNRT but not consistent with either AVRT or NVRT.⁵ The PPI–TCL < 125 ms seems better than 115 ms for differentiating NFRT from atypical AVNRT.⁴ In present case, several His-refractory PVC from right ventricular apex and close to the His during tachycardia did not advance or reset the next His potential as a reproducible finding. For atypical AV node-dependent long RP tachycardias, para-Hisian pacing is generally not useful because an AV nodal response is not diagnostic of pure AV nodal conduction but can also be observed with a NF pathway.⁴ In current case, we could not dissociate His potential from

tachycardia and also not induce mechanical right BBB to evaluate the impact of BBB on tachycardia CL; however, the long PPI and His-refractory PVC findings seem sufficient to make a diagnosis of atypical AVNRT. A slow pathway ablation was successful in eliminating the arrhythmia.

CONFLICT OF INTEREST

The authors declare no conflict of interest for this article

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