



EP/ECG Corner: Unknown of the Month

Initiation and termination of a wide complex tachycardia by an atrial beat

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KEYWORDS Atriofascicular pathway; Wide complex tachycardia; Mahaim; Double fire phenomenon; Dual ventricular response

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A 28-year-old man with recurrent palpitations and no structural heart disease presented with a documented wide QRS complex tachycardia (WCT). He had a history of slow pathway ablation for atrioventricular (AV) nodal reentrant tachycardia 3 months ago. A standard electrophysiology study was performed using multipolar electrode catheters in the high right atrium, His bundle, right ventricular apex, and coronary sinus. The introduction of atrial extrastimulus from the lateral tricuspid annular region during the tachycardia terminated the tachycardia but recurred after 1 sinus beat (Figure 1). What diagnostic information can be retrieved from the tracing?

Discussion

A WCT may result from supraventricular tachycardia (SVT) with bundle branch block (preexisting or tachycardia-related), SVT with AV conduction over an accessory pathway (AP), or ventricular tachycardia (VT).¹ Intracardiac electrograms show a 1:1 AV relation and negative HV interval, which excludes SVT with left bundle branch block aberrancy. Thus, VT or an AP remains the possible explanations. The reliable initiation and termination of the arrhythmia with a single atrial extrastimulus exclude an automatic focus. The principal unique maneuver in WCT diagnosis is the placement of sensed AESs during the tachycardia.¹ If a AES placed during the WCT terminates the tachycardia without advancing the atrial electrogram near the AV node, the His bundle electrogram, or the next ventricular electrogram, then antidromic tachycardia or pathway-to-pathway tachycardia can be diagnosed.¹ Since the atrium near the AV node and the His bundle are not advanced, tachycardia is not terminated because of penetration into the AV node,

making AV nodal reentry or orthodromic tachycardia unlikely. Since tachycardia is terminated without entering the ventricle, this also excludes VT. Therefore, the only option was the presence of an AP. Indeed, most AV APs exhibit Kent bundle physiology characterized by fast and nondecremental conduction properties. In contrast, atriofascicular APs, which can only reach slow levels of long antegrade decremental conduction, are uncommon. At that point, initiating the tachycardia by a double ventricular response might also give us mechanistic clues of an ongoing tachycardia.^{2,3} Here, a single atrial depolarization leads to 2 ventricular beats: one is AV nodal and the second one atriofascicular physiology, resulting in a “2-for-1 response” or a “double-fire” phenomenon.⁴ The morphology of the wide QRS complexes during rapid atrial pacing was similar to that during the tachycardia. The fact that the QRS morphology is unchanged suggests that this pathway has been used for antegrade activation. Moreover, the A-V/A-A interval index (Figure 1) during the tachycardia was >0.55, suggesting a preexcited tachycardia using a decrementally conducting bypass tract.⁵ The atriofascicular AP was mapped to the 7 o'clock of the tricuspid annulus and was successfully ablated.

Funding Sources: The authors have no funding sources to disclose.

Disclosures: There is no conflict of interest among authors.

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<https://doi.org/10.1016/j.hrthm.2024.04.008>

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Figure 1

Termination of the wide complex tachycardia by an atrial premature contraction and reinitiation after 1 sinus beat.

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