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Intermittent ventricular pacing during supraventricular tachycardia—Tachycardia within a tachycardia?

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Abstract Supraventricular tachycardias (SVT) are not uncommon phenomena in patients implanted with permanent pacemakers for sinus node dysfunction, especially in the presence of intact atrioventricular conduction. The utility of bedside programming maneuvers and intracardiac electrograms from device interrogation, coupled with observation from telemetry during the tachycardia, makes a clinical diagnosis of the underlying arrhythmia possible even before a definitive electrophysiological study in the EP laboratory. The present case elucidates the usefulness of combining the triumvirate of non-invasive strategies to arrive at a clinical diagnosis and aid in the management of the SVT.

Case Report

An 82-year-old man with a history of stable ischemic heart disease presented to the emergency department with recurrent episodes of palpitations 2 months after a dual chamber permanent pacemaker (PPM) was implanted for sinus node dysfunction. An ECG is obtained (Fig. 1).

A review of his previous 12-lead ECGs prior to, and immediately after, his PPM implantation (DDD-R mode) was retrieved for comparison (Figs. 2 and 3).

The morphology and axis of the QRS complexes during sinus rhythm (and atrial paced, ventricular sensed rhythm) and tachycardia appear similar, and a diagnosis of supraventricular tachycardia with aberrancy was diagnosed. His palpitations spontaneously resolved while in the emergency department observation area, and he was admitted to the cardiology ward for further management. A chest X-ray (CXR) (Fig. 4) was performed as part of the work-up. An inpatient transthoracic echocardiogram was also done and revealed normal cardiac function.

While in the cardiology ward, he was monitored on continuous telemetry. A further recurrence of his tachycardia took place while he was admitted. The following ECG and telemetry strips captured the event.

His device was interrogated and the following electrogram in Fig. 5 was obtained.

The following are the relevant PPM settings:

Parameters	Settings	Remarks
Mode	DDDR	
Lower rate	60 bpm	
Upper tracking rate	130 bpm	
2:1 rate	119 bpm	
Atrial upper rate	240 bpm	
Mode switching	On	Switch to DDIR
AV delay	Sense AV delay (ms)	Pace AV delay (ms)
- At 60 bpm	180	200
- At 80 bpm	120	140
- At 100 bpm	110	130
- At 120 bpm	100	120
- At 140 bpm	90	110
AV hysteresis	Pace AV hysteresis (ms)	
- At 60 bpm	400	
- At 80 bpm	400	
- At 100 bpm	400	
- At 120 bpm	380	
- At 140 bpm	300	
PVARP	325 ms	
V blanking after Ap	30 ms	

A detailed analysis of the tracings led to a diagnosis of a *short R-P tachycardia with aberrant conduction*, most likely typical atrioventricular nodal reentrant tachycardia (AVNRT), and he was offered an electrophysiology study with ablation of the slow pathway for definitive treatment for

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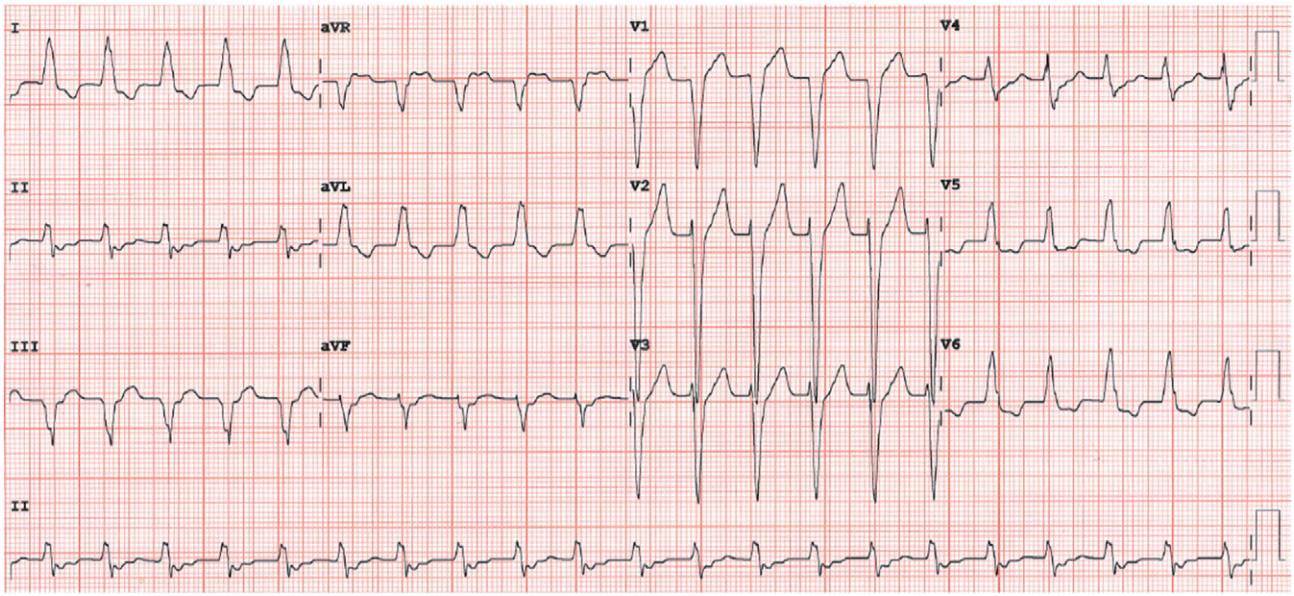

Fig. 1. 12-Lead ECG showing regular wide complex tachycardia.

his recurrent SVT. While waiting in the EP laboratory, he went into spontaneous SVT again. Programmed electrical stimulation via the remote PPM programmer was performed.

The EP study performed was consistent with a typical AVNRT. During tachycardia, VA time was almost instantaneous, and the earliest A was at the His catheter. The slow pathway was successfully ablated with no recurrence of the AVNRT despite isoprenaline infusion.

Discussion

This case illustrates a few key principles of SVT, and is especially intriguing as an intracardiac device is available to "look" at the electrical events from within the heart during the tachycardia.

This case is interesting as it demonstrates:

1. Group ventricular pacing during a supraventricular tachycardia
2. Correlation of information from surface ECG and telemetry, intracardiac EGM from the PPM, and programmed electrical stimulation with the PPM
3. Presence of intra-atrial and/or intra-nodal decremental conduction during typical AVNRT

During the tachycardia, a wide complex QRS with LBBB morphology is observed. This was consistent with the patient's

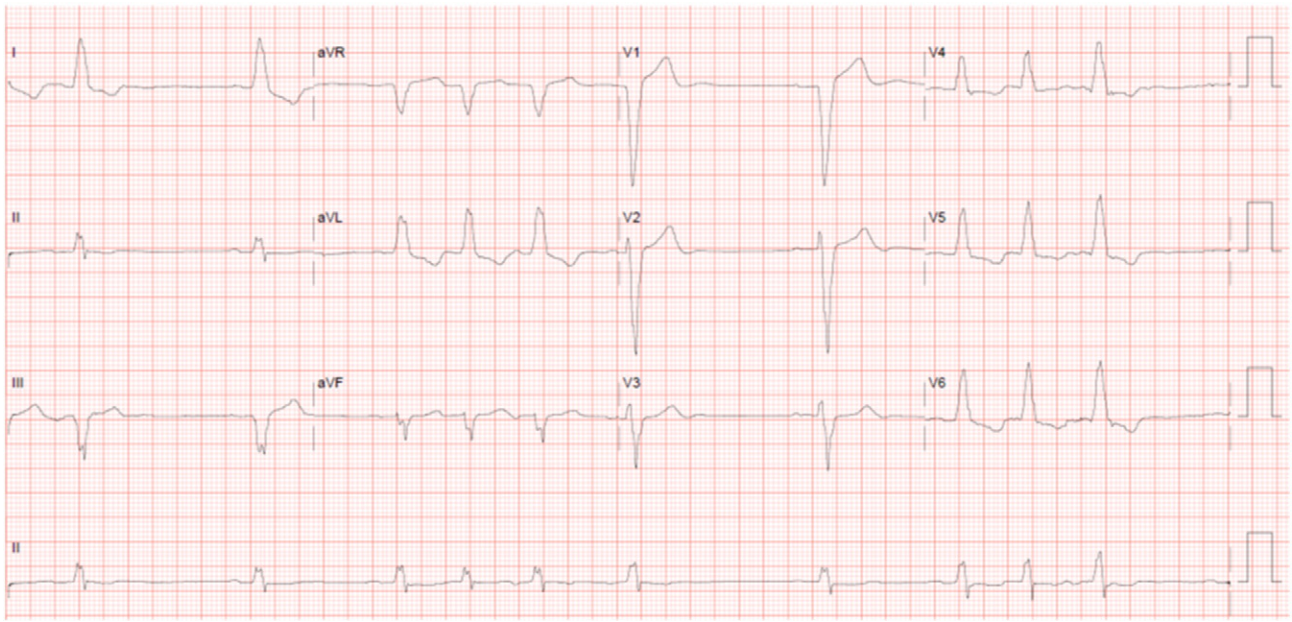

Fig. 2. 12-Lead ECG showing sinus pauses and baseline left bundle branch block.