

# ECG Quiz

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A 17-year-old boy attended Accident and Emergency Department because of palpitation. He described as fast and regular heart beats. There was no associated dizziness. He had experienced intermittent fast palpitations for few months, but never as severe as this time. Otherwise he enjoyed good past health and he had no history of syncope. Family history was unremarkable. He was hemodynamically stable and fully conscious. A 12-lead electrocardiogram (ECG) was performed immediately (Figure 1).

The patient was admitted to coronary care unit (CCU). The tachycardia was aborted when the patient was admitted to CCU. A 12-lead ECG was repeated and shown in Figure 2. It showed delta waves and the diagnosis of Wolff-Parkinson-White Syndrome was made. Electrophysiology study confirmed the presence of right free wall accessory pathway and radiofrequency ablation was performed. There was no recurrence of symptoms for six months after the procedure.

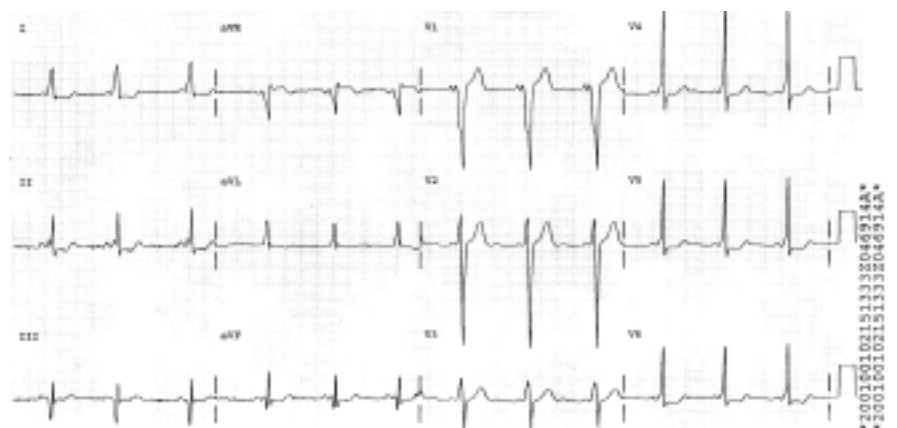
## Question

**What is the ECG diagnosis?**

- A) monomorphic ventricular tachycardia (VT)
- B) supraventricular tachycardia (SVT) with aberrant conduction
- C) SVT with anterograde conduction over an accessory atrioventricular pathway



**Figure 1.**



**Figure 2.**

**Answer: C**

### Discussion

It is always a difficult clinical task to have a correct ECG diagnosis for regular wide complex tachycardia. Differential diagnoses include VT, SVT with aberrant conduction and SVT with anterograde conduction over an accessory atrioventricular pathway (antidromic SVT). Differentiation among these is important because the immediate management is different. However, fast and reliable method is not always available. We adopted the stepwise approach suggested by Antunes et al published in September 1994 in PACE Vol. 17.<sup>1</sup>

The first step aims to differentiate VT or antidromic SVT from SVT with aberrant conduction. There are four questions:

1. Absence of an RS complex in all precordial leads? If the answer is yes, it suggests VT or antidromic SVT. If not, go to question 2.
2. Onset of R to nadir of S interval >100 ms in 1 precordial lead? If the answer is yes, it suggests VT or antidromic SVT. If not, go to question 3.
3. More QRS complexes than P waves? If the answer is yes, it suggests VT or antidromic SVT. If not, go to question 4.
4. Classic morphology criteria for VT present in leads V1 and V6 (i.e. R, qR, QR or RS in V1; R:S ratio <1 in V6 if frontal axis showed left axis deviation; qR or QS in V6 if left bundle branch morphology)? If the answer is yes, it is VT or antidromic SVT. If the answer is "no" again, VT or antidromic SVT is excluded, and the diagnosis of SVT with aberrant conduction is made.

The second step is to differentiate VT from antidromic SVT. There are three questions:

1. Predominantly negative QRS complexes in the precordial leads V4 to V6? If yes, it is VT. If the answer is no, go to question 2.
2. Presence of a QR complex in one or more of the precordial leads V2 to V6? If yes, it is VT. If the answer is no, go to question 3.
3. AV relation different from 1:1? (More QRS complexes than P waves?) If yes, it is certainly VT. If the answer is no, VT is excluded and the diagnosis of antidromic SVT is made.

The admission ECG of the patient showed RS complex in V4 to V6. However, the R to S interval is 140 ms in V6. Based on step one, it suggested VT or antidromic SVT. We proceeded to the second step. The QRS complexes of V4 to V6 were predominantly positive, and there was no QR pattern seen in V2 to V6, and there was no atrioventricular dissociation identified. The answers to all 3 questions in step 2 were "no". This excluded ventricular tachycardia and the diagnosis of antidromic SVT was suggested. Antidromic SVT with anterograde conduction via right free wall accessory pathway was inducible in electrophysiology study with identical morphology as admission ECG.

### Reference

1. Antunes E, Brugada J, Steurer G, Andries E, Brugada P. The differential diagnosis of a regular tachycardia with a wide QRS complex on the 12-lead ECG: ventricular tachycardia, supraventricular tachycardia with aberrant intraventricular conduction, and supraventricular tachycardia with anterograde conduction over an accessory pathway. *Pacing Clin Electrophysiol* 1994;17:1515-24.