

ECG TEACHING COMPETITION

ADVANCED

IMAGING VIGNETTE: ECG CHALLENGE

# Wide Complex Tachycardia in a Young Woman



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## ABSTRACT

A 27-year-old woman presented with palpitations and was found to have episodes of a non-sustained wide complex tachycardia. In this report, we discuss a differential diagnosis for the patient's wide complex tachycardia and the important ECG findings which lead to her diagnosis. (**Level of Difficulty: Advanced.**)  
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## CASE

A 27-year old woman with a history of anxiety presented with several days of intermittent palpitations. She had recently recovered from an upper respiratory infection. On presentation to the emergency department, she had a heart rate of 80 beats/min and blood pressure of 155/78 mm Hg. She had no family history of sudden cardiac death and a normal echocardiogram result. On telemetry, she was noted to have short runs of non-sustained wide complex tachycardia. An electrocardiogram was obtained (**Figure 1**).

### WHAT IS THE DIAGNOSIS?

- A. Supraventricular tachycardia with aberrancy
- B. Supraventricular tachycardia with pre-excitation
- C. Moderator band ventricular tachycardia
- D. Outflow tract ventricular tachycardia
- E. Fascicular ventricular tachycardia

The correct answer is D.

## EXPLANATION

The electrocardiogram (ECG) begins with 2 beats of sinus rhythm with a heart rate of 91 beats/min, followed by a 19-beat run of a wide complex tachycardia with an inferior axis and left bundle branch block (LBBB) morphology (**Supplemental Figure 1**).

The differential diagnosis for a wide complex tachycardia includes ventricular tachycardia (VT), supraventricular tachycardia (SVT) with aberrancy, and SVT with pre-excitation. Ventriculo-atrial (VA) dissociation or VA conduction with variable block suggests VT over an SVT. The ECG shown above

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**ABBREVIATIONS  
AND ACRONYMS**

**ARVC** = arrhythmogenic right ventricular cardiomyopathy

**ECG** = electrocardiogram

**LBBB** = left bundle branch block

**LVOT** = left ventricular outflow tract

**RVOT** = right ventricular outflow tract

**SVT** = supraventricular tachycardia

**VA** = ventriculo-atrial

**VT** = ventricular tachycardia

(Supplemental Figure 1) shows 3:1 VA conduction, which demonstrates a P-wave following every third QRS complex of the tachycardia and the constant relationship between the QRS complex and p-wave. The duration of >60 ms from the onset of the QRS to the nadir of the S-wave in V<sub>1</sub> and V<sub>2</sub> also favors VT over an SVT (1). The LBBB morphology with an inferior axis localizes the origin of the VT most likely to the ventricular outflow tract.

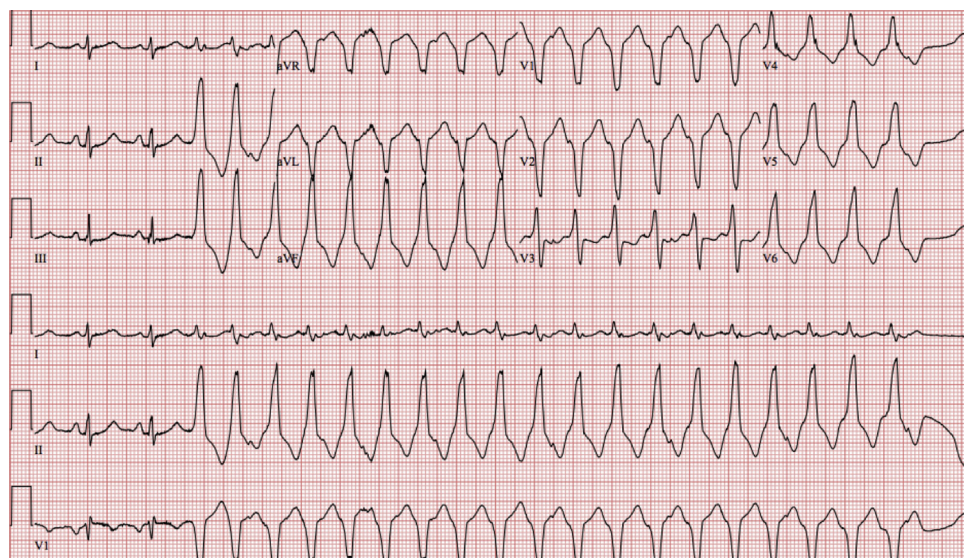
Outflow tract VT is an idiopathic VT which can occur in otherwise healthy individuals at any age without obvious structural heart disease (2). This arrhythmia can arise from either the right ventricular outflow tract (RVOT) or left ventricular outflow tract (LVOT). Conventionally, an earlier R-wave transition (ie, lead V<sub>2</sub>) favors left ventricular origin, but often this can only be confirmed with mapping in the electrophysiology laboratory. The rightward axis of the RVOT VT occurs because the outflow tracts cross, which renders the RVOT to the left of the LVOT. Outflow tract ventricular tachycardias are caused by cyclic adenosine monophosphate-mediated triggered activity which can be terminated with adenosine (2,3).

Treatment of RVOT VT can be deferred if the patient is asymptomatic and has infrequent ectopy unlikely to cause tachyarrhythmia-induced cardiomyopathy. These patients should be monitored for ectopic burden and left ventricular ejection fraction. When treatment is pursued, catheter ablation often is the recommended therapy over metoprolol or propafenone due to the effectiveness and low complication rates of the procedure (4). RVOT VT can be difficult to differentiate from arrhythmogenic right ventricular cardiomyopathy (ARVC) (4), and it is important to assess patients for characteristics suggestive of ARVC (eg, epsilon waves and T-wave inversions in V<sub>1</sub> to V<sub>3</sub>) and a family history of sudden cardiac death.

Fascicular VT (answer choice 5) is another type of idiopathic VT, although its typical pattern is a right bundle branch block (RBBB) morphology with superior axis when arising from the left posterior fascicle and inferior when arising from the left anterior fascicle (5). The first-line pharmacologic treatment for fascicular VT is verapamil. Moderator band VT (answer choice 3) is a macro-re-entrant circuit which arises from the moderator band connecting the right ventricular free wall and the interventricular septum. It is characterized by an LBBB morphology with a superior axis. Moderator band VT can instigate ventricular fibrillation and is often treated with antiarrhythmic agents or ablation (4).

This patient was started on verapamil therapy, although she continued to be symptomatic from her ventricular tachycardia. She was brought to the electrophysiology laboratory where her VT was mapped to the RVOT and was successfully ablated with significant improvement in her symptoms.

**FIGURE 1** Electrocardiographic Tracing



The patient's electrocardiogram obtained in the emergency department.

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**KEY WORDS** ablation, supraventricular tachycardia, ventricular tachycardia

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**APPENDIX** For a supplemental figure, please see the online version of this article.