

IMAGING VIGNETTE

ADVANCED

ECG CHALLENGE

Wide Complex Tachycardia

The Answer Is in Front of You



Arjun B. Gupta, MD, MPH, Huazhen Chen, MD, Marc A. Miller, MD

ABSTRACT

Supraventricular tachycardia with aberrancy and ventricular tachycardia can often be differentiated on the basis of subtle findings. We present an electrocardiogram with findings of Coumel's sign, which is diagnostic of atrioventricular re-entrant tachycardia using an accessory pathway. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2023;11:101766)
© 2023 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

A 70-year-old man with previous history of 2-vessel coronary disease and preserved left ventricular function was admitted to the hospital for palpitations and dizziness. The following electrocardiogram was recorded ([Figure 1](#)). What would you recommend?

- A. Secondary-prevention implantable cardioverter-defibrillator insertion
- B. Catheter ablation of ventricular tachycardia
- C. Catheter ablation of atrioventricular nodal re-entrant tachycardia
- D. Catheter ablation of atrioventricular reciprocating tachycardia

The answer is D.

DISCUSSION/RATIONALE

The presence of wide complex tachycardia in a patient with multivessel coronary diseases raises the suspicion of ventricular tachycardia (VT). However, the wide QRS complexes are consistent with a typical left bundle branch block (LBBB) morphology, which suggests the possibility of supraventricular tachycardia (SVT) with aberrant conduction. In addition, there are 2 consecutive narrow beats at the end of the rhythm strip, which also suggests SVT as a mechanism. What type of SVT is this?

The cycle length of the tachycardia beats that have an LBBB morphology is 320 ms, whereas the cycle length of the tachycardia with a narrow QRS interval have a shorter cycle length of 280 ms. When an orthodromic atrioventricular reciprocating tachycardia (AVRT) incorporates the bundle branch ipsilateral to the accessory pathway as part of its circuit, the development of rate-related bundle branch block can result in the antegrade conduction down the contralateral bundle, resulting in prolongation of the re-entrant circuit and a slower cycle length (and heart rate). In moments where conduction is restored down both bundles, resulting in a narrow QRS interval, the length of the circuit and the cycle length are reduced

From the Zena and Michael A. Wiener Cardiovascular Institute, Icahn School of Medicine at Mount Sinai, New York City, New York, USA.

The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the [Author Center](#).

Manuscript received December 11, 2022; revised manuscript received January 11, 2023, accepted January 19, 2023.

**ABBREVIATIONS
AND ACRONYMS****AVRT** = atrioventricular
reentrant tachycardia**LBBB** = left bundle branch
block**SVT** = supraventricular
tachycardia**VT** = ventricular tachycardia

(Figure 2). The finding of slowing tachycardia with the concurrent development of functional bundle branch block ipsilateral to the accessory pathway was first described by Philippe Coumel in 1974 (“Coumel’s sign”).¹

Additionally, the eighth and 23rd QRS complexes appear to have a similar morphology, but are distinctly different than either the narrow QRS or wide QRS interval beats of tachycardia. These are premature ventricular contractions with QRS fusion, which “peel back” the refractoriness of the left bundle and allow the left bundle to conduct. (Hence, the narrow beats of tachycardia occur immediately after the premature ventricular contractions.) This has been described as the “linking phenomenon” in which there is concealed retrograde activation of a bundle that leads to a functional block.² The premature ventricular contractions peeling back refractoriness of the left bundle allow for both bundles to conduct and for the identification of Coumel’s sign.

Identification of Coumel’s sign facilitated differentiating SVT with aberrancy from VT and pointed to orthodromic AVRT with an accessory pathway ipsilateral to the affected bundle as the mechanism of the tachycardia. The patient underwent an electrophysiologic study that confirmed the presence of orthodromic AVRT caused by a concealed left lateral accessory. Catheter ablation was performed, and there has been no recurrence of symptoms.

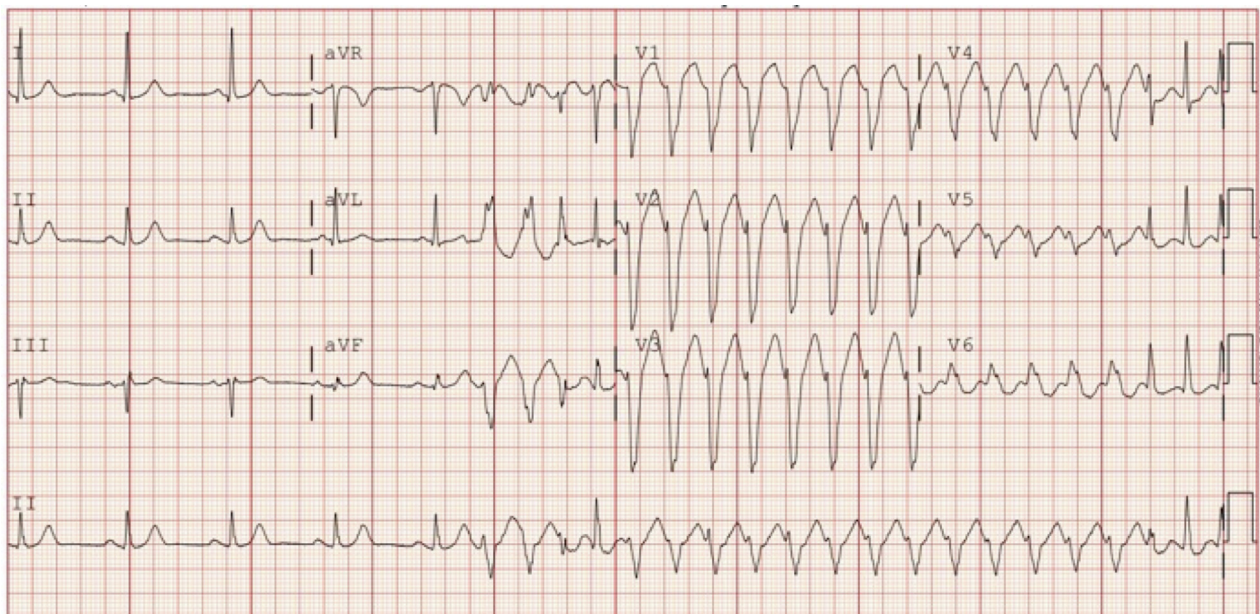
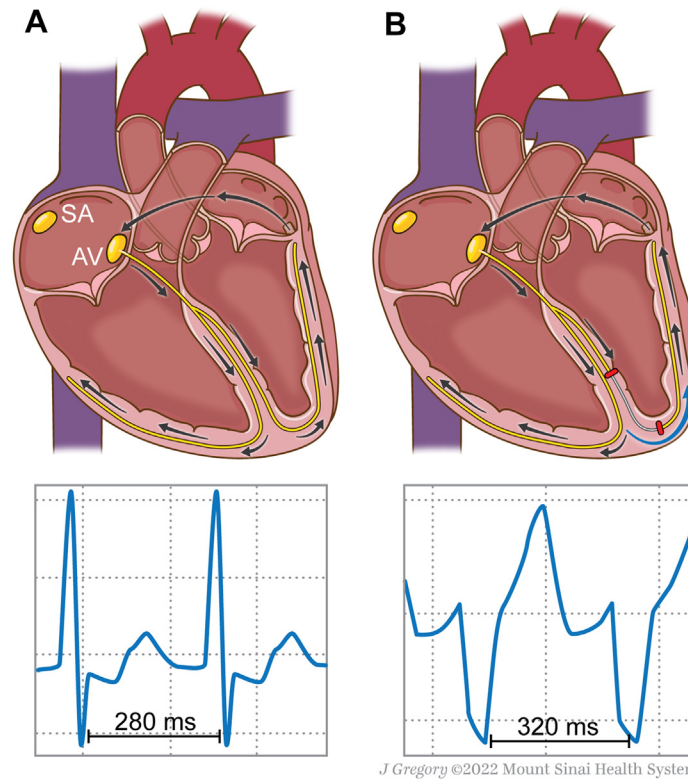
FIGURE 1 The Patient’s Presenting ECG

FIGURE 2 Mechanism of Coumel's Sign



Orthodromic atrioventricular reentrant tachycardia using the left-sided accessory pathway in the absence and presence of left bundle branch block. On the right, with the left bundle branch block, the circuit passes through the right bundle and takes longer to reach the left-sided accessory pathway. Printed with permission from © 2022 Mount Sinai Health System. AV = atrioventricular node; SA = sinoatrial node.

ACKNOWLEDGMENT The authors thank Jill Gregory, CMI, FAMI, for her illustration.

FUNDING SUPPORT AND AUTHOR DISCLOSURES

The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

ADDRESS FOR CORRESPONDENCE: Dr Arjun B. Gupta, Icahn School of Medicine at Mount Sinai, 1 Gustave L Levy Place, New York, New York 10029, USA. E-mail: arjun.gupta@mountsinai.org. Twitter: [@ArjunBGupta](https://twitter.com/ArjunBGupta).

REFERENCES

1. Coumel P, Attuel P. Reciprocating tachycardia in overt and latent preexcitation. Influence of functional bundle branch block on the rate of the tachycardia. *Eur J Cardiol*. 1974;1(4):423-436.
2. Lehmann MH, Denker S, Mahmud R, Addas A, Akhtar M. Linking: a dynamic electrophysiologic phenomenon in macroreentry circuits. *Circulation*. 1985;71(2):254-265.

KEY WORDS atrioventricular reentrant tachycardia, Coumel's sign, supraventricular tachycardia