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ECG TEACHING COMPETITION

INTERMEDIATE

IMAGING VIGNETTE: ECG CHALLENGE

Wide Complex Tachycardia and Flecainide

A Dangerous Couple

Marco Bergonti, MD,[a,b,c] Ciro Ascione, MD,[a,b] Claudio Tondo, MD, PhD,[c,d] Andrea Sarkozy, MD, PhD[b,e]

ABSTRACT

Differential diagnosis of wide complex tachycardia in patients taking anti-arrhythmic can be challenging. Conventional ECG diagnostic criteria are poorly specific and should be applied with caution. Patients who develop life-threatening arrhythmias after flecainide infusion should be screened for Brugada Syndrome, especially if concomitant sinus node dysfunction is present. (**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2021;3:1373–1375) © 2021 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/).

CASE

A 55-year-old woman known to have paroxysmal atrial fibrillation (AF) was admitted to the emergency department with palpitations. She had no medical history. Her medications included 100 mg of metoprolol and 100 mg of flecainide per day.

Electrocardiography (ECG) at admission showed atrial flutter (AFL) with 2:1 atrioventricular conduction at a ventricular rate of 70 beats/min with left anterior fascicular block. Flecainide, 150 mg IV, was administered. Severe sinus bradycardia (Supplemental Figure 1) developed, for which atropine and adrenaline were administered. After a brief period, she started reporting a feeling of “imminent death”; her heart rate rapidly increased, and her hemodynamic status deteriorated. Another ECG was recorded (**Figure 1**).

WHAT IS THE DIAGNOSIS?

A. AF and flecainide-induced QRS widening
B. Pre-excited AF over a left catecholamine-sensitive accessory pathway
C. Sinus tachycardia with runs of non-sustained ventricular tachycardia (VT)
D. Monomorphic VT with occasional fusion/captures beats
E. Sinus tachycardia with runs of atrial tachycardia and flecainide-induced QRS widening

The correct answer is E. It is not possible to exclude A and C.

From the [a]University of Milan, Cardiovascular Disease Fellowship Program, Milan, Italy; [b]Department of Cardiology, University Hospital Antwerp, Edegem, Belgium; [c]Department of Clinical Electrophysiology and Cardiac Pacing, Centro Cardiologico Monzino, Istituto di Ricovero e Cura a Carattere Scientifico, Milano, Italy; [d]Department of Biomedical, Surgical and Dental Sciences, University of Milan, Milano, Italy; and the [e]Cardiovascular Research, University of Antwerp, Antwerp, Belgium.
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ABBREVIATIONS AND ACRONYMS

AF = atrial fibrillation

CL = cycle length

ECG = electrocardiogram

FLA = atrial flutter

RBBB = right bundle branch block

VT = ventricular tachycardia

EXPLANATION

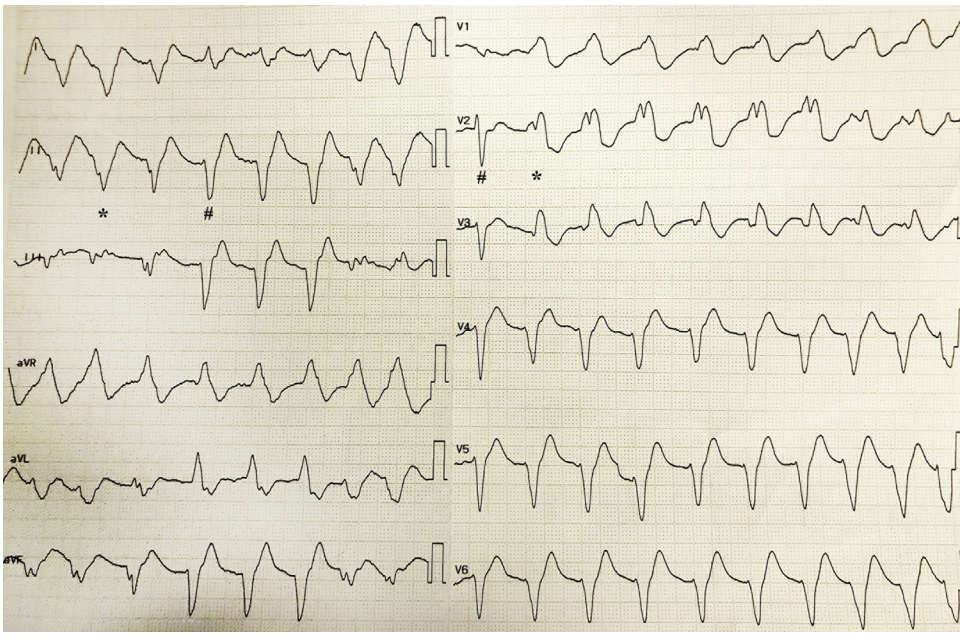
The ECG showed irregular polymorphic wide QRS complex tachycardia at a rate of 110 beats/min with right bundle branch block (RBBB) morphology and superior axis. Two different QRS morphologies can be identified. First, QRS duration of 200 ms with −150° axis (**Figure 1**, asterisk); second, QRS duration of 130 ms with −90° axis (**Figure 1**, hash mark).

Morphologic criteria are far more consistent with VT. The RBBB pattern with monophasic R in V_1, rS in V_6, and monophasic R-wave in aVR strongly point toward a diagnosis of VT (1). However, RBBB morphology with QRS <200 ms and a preserved narrow initial portion of the QRS suggest features of supraventricular origin in the context of flecainide toxicity (1,2) The presence of predominantly negative QRS complexes in the precordial leads (V_4 to V_6) makes pre-excitation very unlikely. However, conventional ECG criteria are poorly applicable in patients with flecainide intoxication (1,2). Surface ECG analysis is often inconclusive in this setting, and other features should be taken into account.

In this case, it is helpful to consider how the arrhythmia started. Supplemental Figure 2 shows that, at the beginning, there is a narrow complex tachycardia at 100 beats/min (cycle length [CL]: 600 ms), which accelerates progressively. Once the tachycardia cycle becomes shorter than 580 ms, the QRS starts widening. Heart rate-dependent QRS widening favors aberrancy and supraventricular origin. Additionally, QRS variations, both in duration and morphology, are consistently associated with variations in RR cycle. This behavior is suggestive of flecainide-induced QRS widening, triggered by RR cycle variations, translating into heart rate-dependent changes in intramyocardial conduction velocities. Having ruled out pre-excitation and ventricular arrhythmias, it is now hard to say whether the underlying atrial rhythm is sinus with superimposed brief runs of atrial tachycardia or atrial fibrillation. Given the absence of visible fibrillatory waves and the regularly-irregular rhythm, we favor option 5 as the best answer.

Treatment options include direct-current shock, intravenous sodium bicarbonate (1 mEq/kg), or IV lipid emulsion (1.5 mL/kg). Of note, patients who develop life-threatening arrhythmias after flecainide infusion should be screened for Brugada syndrome, especially if concomitant sinus node dysfunction is present (3). Normalized ECG at discharge is reported in Supplemental Figure 3.

FIGURE 1 Electrocardiogram After Injection of Adrenaline Shows Irregular, Wide Complex Tachycardia



Precordial leads and peripheral leads are nonsimultaneous.

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ADDRESS FOR CORRESPONDENCE: Dr. Marco Bergonti, University of Milan, Cardiovascular Disease Fellowship Program at Centro Cardiologico Monzino, Via Parea 4, 20138 Milan, Italy. E-mail: bergmar21@gmail.com. Twitter: @mbergonti.

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KEY WORDS atrial fibrillation, ECG, flecainide toxicity, ventricular tachycardia, wide complex tachycardia

APPENDIX For supplemental figures, please see the online version of this article.