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EDITORIAL COMMENT

Questioning the Perpetrator

The Evidence Is in the Electrocardiogram*

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Every physician who deals with acute and emergency care medicine knows the importance of prompt and effective resuscitation of patients following an episode of sudden cardiac death (SCD) and understands how identification of the potential cause of such cardiac arrest is a determinant in preventing its recurrence and ensuring that the patient recovers from the acute insult. Ventricular fibrillation (VF) is one of the most common presenting arrhythmias in this clinical context (1), and it is often related to acute myocardial ischemia with ST-segment segment elevation in 2 or more leads on the 12-lead electrocardiogram (ECG) (2). ST-segment segment elevation can also be present in a condition called Brugada syndrome (BS), which is not typically associated with myocardial ischemia. Patients with BS are usually young and do not have coronary artery disease, but they are predisposed to develop life-threatening ventricular arrhythmias because of genetic mutations affecting one or more ion channels in the myocardial cells of the right ventricular outflow tract (3).

SEE PAGE 55

In this inaugural issue of *JACC: Case Reports,* Frenchu et al. (4) present a classic case of BS in a patient without a significant past medical history but with a positive family history of early SCD (her father died prematurely at 45 years of age). The clinical scenario is typical for BS: young patient admitted with a febrile illness and abdominal pain secondary to acute appendicitis. Just before entering the operating room, the patient experienced an episode of VF that required external defibrillation for termination. Not surprisingly, the 12-lead ECG recorded right after the event showed the typical Brugada type I pattern seen in precordial leads V_1 and V_2 (**Figure 1**). Although a genetic diagnosis was not available for this patient (only 20% to 30% of patients with a clinical diagnosis of BS have an identified *SCN5A* mutation or other known disease causing gene mutation), the clinical presentation, ECG characteristics, and lack of reversible causes of ST-segment elevation such as metabolic abnormalities or ischemia proved that this was a case of BS and not a Brugada phenocopy (nongenetic conditions causing a Brugada ECG pattern) (5).

This case illustrates the malignant presentation of BS, and Frenchu et al. (4) should be congratulated because they describe with astonishing clarity and simplicity the most important clinical aspects in the diagnosis and management of this syndrome. First, their case underlines a frequently overlooked situation associated with this syndrome: the dynamic nature of ECG changes in patients with BS. Indeed, the patient's first pre-operative ECG was completely normal (compared with the ECG recorded right after the event), and given the patient's lack of prior cardiac history or syncopal events before her admission, both a high index of suspicion and a post-event ECG became crucial to reach the correct diagnosis. The type I ECG pattern in BS is in fact elusive and often elicited in response to particular stressors such as fever and vagal stimulation during intense pain (6), both present in this patient with acute appendicitis. The general consensus (7) is to separate Brugada ECG type I from non-type I patterns, as depicted in **Figure 1**. The ECG is an inexpensive yet indispensable tool to reach a clinical diagnosis and guide the management of post-cardiac arrest patients presenting with VF secondary to BS and other inherited or acquired forms of J-wave syndromes. Second, Frenchu et al. (4) describe a well-thought out treatment plan. Their patient appropriately received

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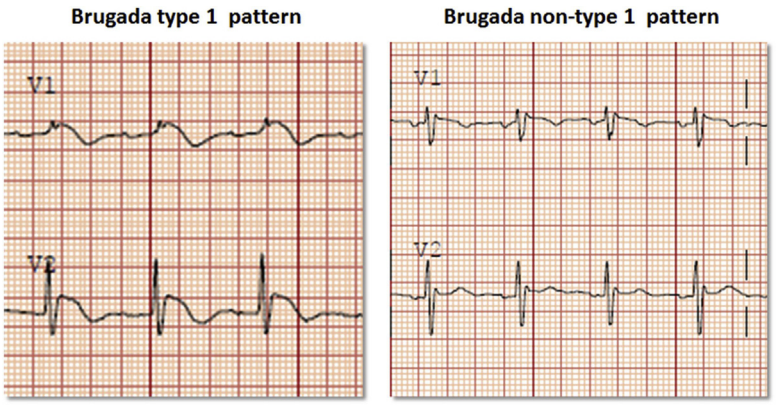
FIGURE 1 Brugada ECG Type I Versus Non-Type I Patterns



(Left) Example of type I electrocardiogram (ECG) pattern showing characteristic prominent coved ST-segment elevation >2 mm followed by negative T-wave. **(Right)** Example of non-type I ECG pattern.

antipyretic agents to control her fever (which is a well-known trigger for ST-segment elevation and arrhythmias in patients with BS) and antiarrhythmic drugs to prevent further VF episodes during and following her surgical procedure. Quinidine reduces the incidence of phase 2 re-entry-dependent polymorphic ventricular arrhythmias (typically associated with BS), and isoproterenol increases sympathetic activity counterbalancing vagal tone. Both drugs thus lead to normalization of the epicardial action potential dome (8). Finally, after recovery from the acute phase, their patient underwent treatment with an implantable cardioverter-defibrillator for secondary prevention of SCD, as is recommended by the international guidelines for management of ventricular arrhythmias (9). Even though implantable cardioverter-defibrillators remain the only therapeutic options to prevent SCD in patients following resuscitated cardiac arrest secondary to BS, novel treatments such as catheter ablation of the epicardial substrate in the right ventricular outflow tract are increasingly performed in selected patients with BS and a high burden of ventricular arrhythmias, and this intervention targeting abnormal electrical areas in the right ventricular epicardium appears to be able to "erase" the BS phenotype from the ECG of these patients (10,11). Further prospective data from randomized clinical trials will help us understand whether this treatment modality will have an impact on the natural history of the disease.

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