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EDITORIAL COMMENT

An Electrocardiogram That Never Grows Old

Atrial Fibrillation in the Context of Manifest Atrioventricular Pre-Excitation*

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Pre-excited atrial fibrillation is a clinical arrhythmia that always fascinates cardiologists of all ages, thanks to its multiple implications. A simple electrocardiogram (ECG) in this context can guide clinicians to a rapid diagnosis, guide therapy, and provide prognostic information.

Therefore, we thank Kieu and Nangia (1) for presenting, in this issue of *JACC: Case Reports,* a case of pre-exited atrial fibrillation with a shortest RR interval of <250 ms, a feature that is known to be associated with a higher risk of ventricular fibrillation and sudden cardiac death.

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This is an ECG that all practicing cardiologists should rapidly recognize, to facilitate appropriate and timely short-term management and plan for definitive therapy with accessory pathway ablation. When faced with such an ECG, cardiologists should always take into account that irregular, wide QRS complex tachycardia needs a proper differential diagnosis: pre-excited atrial fibrillation is the most common, and although ventricular tachycardia can be irregular, it is rarely as irregular as pre-excited atrial fibrillation. Other features that facilitate the diagnosis include the presence of narrow-complex long coupled beats, young age, absence of structural heart disease, and previous documented ECGs with reciprocating supraventricular tachycardia or atrioventricular pre-excitation. However, pre-excited atrial fibrillation may be the first presentation of the Wolff-Parkinson-White (WPW) syndrome (2), and it may manifest at any age, including rarely in older adults.

Once a diagnosis of pre-excited atrial fibrillation is established, 2 important pieces of information must be obtained from the ECG. The first is the location of the accessory pathway: during pre-excited atrial fibrillation with rapid ventricular response, most or all of the beats are fully pre-excited. This means that an evaluation of the configuration of the QRS complex of fully pre-excited beats will predict where the accessory pathway is located and can guide pathway ablation.

More importantly, the heart rate or, more precisely, the shortest RR interval provides prognostic information. The classic high-risk markers in patients with WPW syndrome are a shortest RR interval of <250 ms during pre-exited atrial fibrillation, a history of reciprocating tachycardia, the presence of multiple accessory pathways, and Ebstein's anomaly (3).

The mortality risk in the WPW syndrome is nearly 2 per 1,000 patients-years of follow-up (4) and is the result of rapid pre-excited atrial fibrillation degenerating to ventricular fibrillation (5). Sudden cardiac death related to WPW syndrome can occur at rest, mostly in younger patients in the age range of 20 to 40 years. In up to 26% of patients with sudden cardiac death, this has been the first presentation of WPW syndrome, and it may not be detected at autopsy. WPW syndrome has also been found in association

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with other abnormalities, such as hypertrophic cardiomyopathy, cardiac sarcoid, left ventricular hypertrophy, and idiopathic fibrosis (6).

Risk stratification in patients with asymptomatic WPW syndrome requires evaluation of the refractory of the accessory pathway. Intermittent pre-excitation with ambulatory monitoring or abrupt loss of pre-excitation with exercise testing predicts a pathway not capable of maintaining rapid conduction during atrial fibrillation. These tests have an approximately 90% positive predictive value and a 30% negative predictive value for identifying pathways with life-threatening properties (7). However, noninvasive testing may not be enough, thus warranting evaluation through an invasive electrophysiology study (8). An anterograde refractory period of <240 ms and a shortest RR interval of <250 ms during induced pre-exited atrial fibrillation are proven to be risk factors for ventricular fibrillation (9,10). In addition, the electrophysiology study can also determine the presence of multiple accessory pathways and the ability to induce atrioventricular tachycardia, and it allows for catheter ablation where appropriate.

Catheter ablation of the accessory pathway is the treatment of choice for patients with rapid pre-excited atrial fibrillation, and it provides the potential for curative therapy. Following successful pathway ablation, patients with WPW syndrome have mortality rates similar to those observed in the general population, but they still seem to be prone to develop atrial fibrillation (11,12). Short-term success rates for pathway ablation in real world conditions are 91% to 93% for a single procedure, with a significant complication rate of 1.5% to 3% (13,14).

The case report by Kieu and Nangia (1) gives important advice on the short-term treatment of pre-excited atrial fibrillation. Electrical cardioversion is the safest treatment and is mandatory if the patient is hemodynamically unstable, whereas intravenous ibutilide or procainamide can be used in stable patients. However, drugs that modify atrioventricular nodal conduction, especially verapamil, are contraindicated because they enhance pathway conduction, increase the ventricular rate, and may precipitate ventricular fibrillation.

Pre-excited atrial fibrillation with rapid ventricular rates can be a challenging clinical scenario, given that these patients are at risk of sudden cardiac death. However, with prompt recognition and appropriate short-term management and subsequent curative ablation, these patients are rewarding to treat.

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