

disorder was characterized by autosomal dominant inheritance. Given the propensity for sudden death during sympathetic stimulation in the absence of structural heart disease, catecholaminergic polymorphic ventricular tachycardia was considered to be the likely diagnosis. Sequencing of the cardiac ryanodine receptor 2 (RYR2) gene⁵ (the locus affected in catecholaminergic polymorphic ventricular tachycardia) revealed a novel heterozygous mutation affecting the FKBP12.6-binding domain (c.7210C→A, p.P2404T) that cosegregated with the phenotype. This mutation was absent in 200 healthy controls.

One living family member is a carrier of both mutations. She has clinical characteristics that are consistent with both disorders (i.e., a borderline QTc of 447 msec and premature ventricular beats at a heart rate of 100 beats per minute). Despite therapy with beta-blockers, she had a sudden cardiac arrest at 17 years of age from which she was successfully resuscitated.

Our findings underscore the fact that even when a known genetic disorder is present in a family, other clinically significant conditions may coexist. When there is doubt, the willingness to reevaluate and explore alternative genetic diseases might be the key to putting together the pieces of a complex puzzle.

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Augmentation of J Waves and Electrical Storms in Patients with Early Repolarization

TO THE EDITOR: Early repolarization, consisting of an elevation of the QRS–ST junction (J point), QRS notching or slurring (J wave), and a tall, symmetric T wave, is generally considered to be benign.¹ On the basis of preclinical experimental evidence, it has been suggested that some forms of early repolarization seen in the clinic may not be benign, especially when associated with the occasional appearance of J waves or ST-segment elevation.² Sporadic case reports and basic electrophysiological research have suggested a critical role of the J wave in the pathogenesis of idiopathic ventricular fibrillation.^{3,4} Clinical evidence in support of an association between early repolarization and idiopathic ventricular fibrillation was previously reported in preliminary form by Haïssaguerre et al. and is fully disclosed by these researchers in this issue of the *Journal*.⁵ However,

direct evidence of a relation between early repolarization and the appearance of accentuated J waves in idiopathic ventricular fibrillation has been scarce.

We evaluated the incidence of early repolarization among 1395 controls who were representative of the general population and 15 patients classified as having idiopathic ventricular fibrillation, excluding patients with long- and short-QT syndromes, the Brugada syndrome, or catecholaminergic polymorphic ventricular tachycardia. Among the 15 patients with idiopathic ventricular fibrillation, 4 presented with electrical storm (four or more episodes of ventricular fibrillation in 1 day). Continuous electrocardiographic monitoring of the patients with electrical storm was performed in the coronary care unit.

The incidence of early repolarization among

controls was 3.3%. In contrast, the incidence of early repolarization among patients with idiopathic ventricular fibrillation was 60% (9 of 15 patients). All four patients with idiopathic ventricular fibrillation and electrical storm had early repolarization. These four patients, whose hearts were apparently structurally normal, had a unique electrocardiographic signature consisting of a baseline early repolarization pattern; dramatic but transient accentuation of J waves across the precordial and limb leads before the development of electrical storm, which was precipitated by relatively short-coupled premature ventricular contractions; and suppression of the accentuated J waves and ventricular fibrillation with the administration of quinidine and isoproterenol and with pacing at increasingly rapid rates. In these patients with idiopathic ventricular fibrillation, unlike patients with the Brugada syndrome, the electrocardiographic and arrhythmic abnormalities could not be provoked with intravenous flecainide, were not limited to the right precordial leads, and were not accompanied by abnormalities on the signal-averaged electrocardiogram.

Our observations suggest that an early-repolarization pattern is not always benign, as was previously thought, and that the transient appearance of global J waves in this setting is indicative of a highly arrhythmogenic substrate, representing a unique clinical syndrome associated with a high

risk of sudden death from cardiac causes. We propose that this unique phenotype represents a variant of a much broader syndrome, including the Brugada syndrome, in which the appearance of prominent J waves underlies the development of arrhythmogenicity.

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