The Brugada syndrome (BS) and arrhythmogenic right ventricular cardiomyopathy (ARVC) are currently seen as 2 distinct clinical entities. However, several genetic mutations linked to reduced sodium transmembrane flow and disrupted integrity of the desmosome with resulting fatty infiltration have been identified, corresponding to BS and ARVC, respectively.1

**Case Report**

A 22-year-old male patient was admitted to our hospital with repeated discharges of the implantable cardioverter defibrillator caused by pleomorphic ventricular tachycardia. He had a previous history of survived sudden cardiac death and an implanted single-chamber implantable cardioverter defibrillator in 2010. No data on work-up of genetic arrhythmias had been available to date. On current clinical presentation in echocardiography, normal ejection fraction and heart diameter could be determined.

Because of abnormal ECG pattern in a sense of an incomplete right bundle branch block with slightly elevated ST-segments and T-wave inversions in the right precordial leads, an ajmaline test was conducted (Figure A). This resulted in prominent coved-type Brugada ECG (Figure B).

An electrophysiological study was performed. During programmed ventricular stimulation (500/S4), a sustained and hemodynamically nontolerated ventricular tachycardia (VT) with superior axis and R/S transition in V5 was induced reproducibly (Figure C). During endocardial voltage mapping, no pathological electrogroms were found in the endocardial right ventricular/right ventricular outflow tract (Figure E). Because of a suspected epicardial right ventricular outflow tract exit and the lack of endocardial substrate, an epicardial mapping was performed. The epicardial electrogroms recorded from the lateral tricuspid annulus, and the anterior right ventricular outflow tract showed low-voltage zones and late potentials during sinus rhythm (Figure F). During substrate modification, repetitive spontaneous VTs occurred. Ablation end point was the loss of ventricular pace capture with full output (10 V/2 ms) pacing in low-voltage zone and noninducibility of any VT during programmed ventricular stimulation.

In addition, a genetic test was conducted. The abnormality of the SCN5A gene was not detected, but mutations of PKP2 and DSP genes were revealed. During 9 months of follow-up, device interrogation showed no recurrence of any VT episodes.

**Discussion**

This patient clinically qualifies as having BS (type 1 Brugada ECG pattern, history of spontaneous VT episode, history of survived sudden cardiac death, and inducibility of VT by programmed ventricular stimulation). On the other hand, the presence of 2 abnormalities in desmosomal genes together with the electrophysiological presentation points toward ARVC.

A recent study shows that the patients diagnosed with BS could represent a rather heterogenic group comprising of individuals with mutations of desmosomal genes in as much as 3% of cases.1 The postulate suggests that mutations of PKP2 gene present in patients diagnosed with BS and consecutive loss of desmosomal integrity could lead to reduced sodium current and hereby arrhythmogenic state through delayed depolarization.

Our case supports the proposed notion that (clinically defined) BS and ARVC are not separate entities, but rather 2 manifestations of myocardial disease resulting in apoptosis with fatty infiltration or sodium channel dysfunction to a variable extent.

The role of the arrhythmogenic substrate in BS was already extensively studied. Lambiase et al2 identified marked endocardial conduction delay in right ventricular outflow tract in 18 patients and hypothesized that this could be the target for

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*Circ Arrhythm Electrophysiol is available at http://circcep.ahajournals.org

DOI: 10.1161/CIRCEP.114.002342

Images and Case Reports in Arrhythmia and Electrophysiology

Epicardial Ventricular Tachycardia Ablation in a Patient With Brugada ECG Pattern and Mutation of PKP2 and DSP Genes

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Received September 22, 2014; accepted January 7, 2015.
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(Circ Arrhythm Electrophysiol. 2015;8:505-507. DOI: 10.1161/CIRCEP.114.002342.)

505
extended therapy. Nademanee et al3 reported a study group of patients with BS treated with epicardial ablation to prevent episodes of malignant arrhythmia. Described cohort exhibited similar electrocardiographic features and substrate pattern as our patient. Considering that the patient selection was based on clinical criteria only and hence phenotype with no genetic analysis, it is uncertain whether conclusions on such targeted therapy can be drawn because the presence of ARVC in the concealed phase mimicking BS remains a possibility.

As in the case of SCN5A gene, the mutations of PKP2 obviously manifest in more phenotypic variants.4 Even though routine analysis of mutation of desmosomal genes in patients diagnosed with BS remains open to question, recent evidence implies the diagnostic value for patients and their relatives who tested negative for the gene mutations associated with the disease (BS). In addition, in the context of systematic sudden cardiac death prevention, precautions in taking medication (and possibly other factors) known to precipitate malignant arrhythmias in BS should be considered in individuals with desmosomal mutations (particularly in those with PKP2 abnormalities) because it could lead to such events even in the concealed phase of the disease.

Disclosures

None.

References


**Key Words:** arrhythmogenic right ventricular dysplasia ■ Brugada syndrome ■ electrophysiology ■ genetic testing
Figure. A. Baseline 12-lead ECGs before ajmaline test. B. After infusion of 40 mg ajmaline, overall prominent coved-type Brugada ECG unmasked. C. Twelve-lead ECGs of the ventricular tachycardia. D. Examples of late potentials (asterisks), recorded from the epicardium. E. Endocardial voltage map with no signs of low-voltage zones. F. The voltage map shows epicardial low voltage in red and high voltage in purple. Red dots represent ablations. The ablation was performed with a thermocool surround flow F-type (Biosense Webster) in combination with a steerable sheath (Agilis epi, SJM). Bipolar voltage map thresholds: purple, >1.5 mV=normal myocardium; red, <0.5 mV=scar; blue, green, and yellow 1.5 to 0.5 mV=border zone. Abnormal electrograms are defined as electrograms that have (1) low voltage (≤1.5 mV), (2) split electrograms, and (3) wide duration (>80 ms) or late potentials.
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Circ Arrhythm Electrophysiol. 2015;8:505-507
doi: 10.1161/CIRCEP.114.002342

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