

Ventricular and supraventricular arrhythmias and heart failure in a patient with left ventricular noncompaction and Brugada syndrome

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Abstract

We report a 47 year-old male patient with coexistence of left ventricular noncompaction and Brugada syndrome. He presented malignant ventricular arrhythmias followed by cardioverter-defibrillator implantation, atrial fibrillation and flutter and progressive heart failure. This case could be an example of the coexistence of two rare diseases of various genetic patterns that only partially showed overlapping symptomatology and complications, particularly ventricular arrhythmias. (Cardiol J 2011; 18, 3: 310–313)

Key words: left ventricular noncompaction, Brugada syndrome

Introduction

Left ventricular noncompaction (LVNC) is a rare congenital, genetic, primary cardiomyopathy, resulting from an arrest of compaction of the loose mesh of cardiac muscle fibers during embryogenesis [1]. Morphologically, it is characterized by the presence of two myocardial layers: a thin epicardial layer and a thick noncompacted endocardial layer with deep intertrabecular recesses, which communicate with the ventricular cavity [2–4]. The prevalence of the disease is estimated to be 0.05% of the adult population [1].

Left ventricular noncompaction may be an isolated malformation or may be associated with other congenital heart diseases, such as left or right ventricular outflow tract obstruction or pulmonary atresia without interventricular septal defect [2, 3]. This association has been shown to result from mutations in the alpha-dystrobrevin gene and transcription factor NKX2.5 [1]. In patients with an isolated form of LVNC, mutations in the G4.5 gene have been report-

ed [1, 5]. Left ventricular noncompaction may coexist with neuromuscular disorders (e.g. Becker muscular dystrophy) and with facial dysmorphism [6, 7].

Since the first description of LVNC published in 1990 by Chin et al. [4] interest in this specific cardiomyopathy has increased mainly due to its natural history, which includes left ventricular dysfunction leading to heart failure, arrhythmias, sudden cardiac death and thromboembolism.

Brugada syndrome is an autosomal dominant inherited disease characterized by an ST-segment elevation in the right precordial leads and a high incidence of sudden cardiac death due to malignant ventricular arrhythmias [8]. The syndrome is linked to mutations in gene SCN5A, which encodes for the alpha-subunit of the cardiac sodium channel [9]. However, SCN5A mutations account for only 20–30% of Brugada syndrome cases. The prevalence of the syndrome is estimated to be 5–58 per 10,000 inhabitants, but the true prevalence is difficult to assess because of the dynamic and often concealed character of the ECG Brugada pattern [8].

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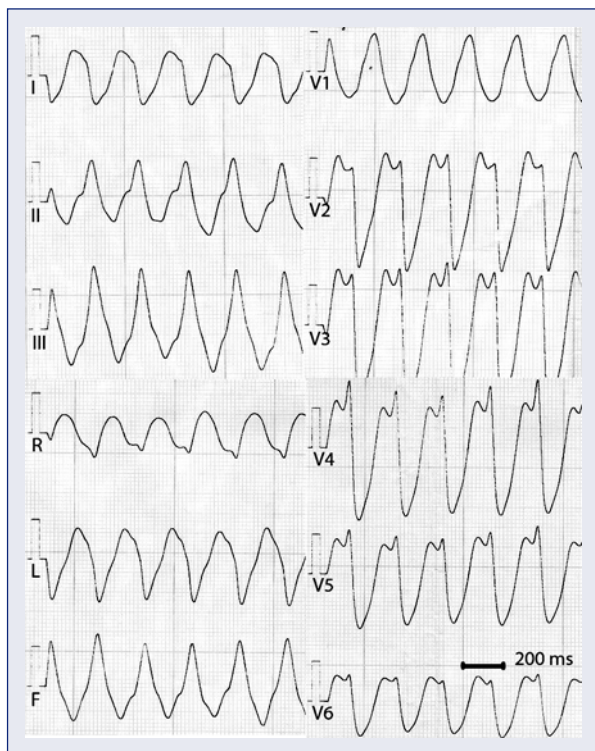


Figure 1. Electrocardiogram showing fast ventricular tachycardia.

We present the case of a 47 year-old man with electrocardiographic features and clinical symptoms of Brugada syndrome and echocardiographic findings characteristic of LVNC.

Case report

A 47 year-old man with two episodes of cardiac arrest due to ventricular fibrillation (VF) and fast ventricular tachycardia (VT) (Fig. 1) was referred to our hospital for implantation of a cardioverter-defibrillator (ICD). His medical history included several episodes of syncope, paroxysmal atrial fibrillation (AF) and flutter (AFL), psoriasis, arterial hypertension and type 2 diabetes mellitus. His two brothers died suddenly at the ages of 28 and 47.

Twelve-lead electrocardiogram (ECG) showed normal sinus rhythm and typical Brugada pattern type 1 (coved-type) (Fig. 2). Transthoracic echocardiography revealed a slightly enlarged hypokinetic left ventricle with left ventricular end-diastolic diameter of 61 mm, and ejection fraction of 45%. Moreover, a markedly thickened endocardium in the apical region of anterior and lateral walls with enhanced trabeculation and deep intertrabecular recesses was found (Fig. 3). The ratio of noncompacted layer to

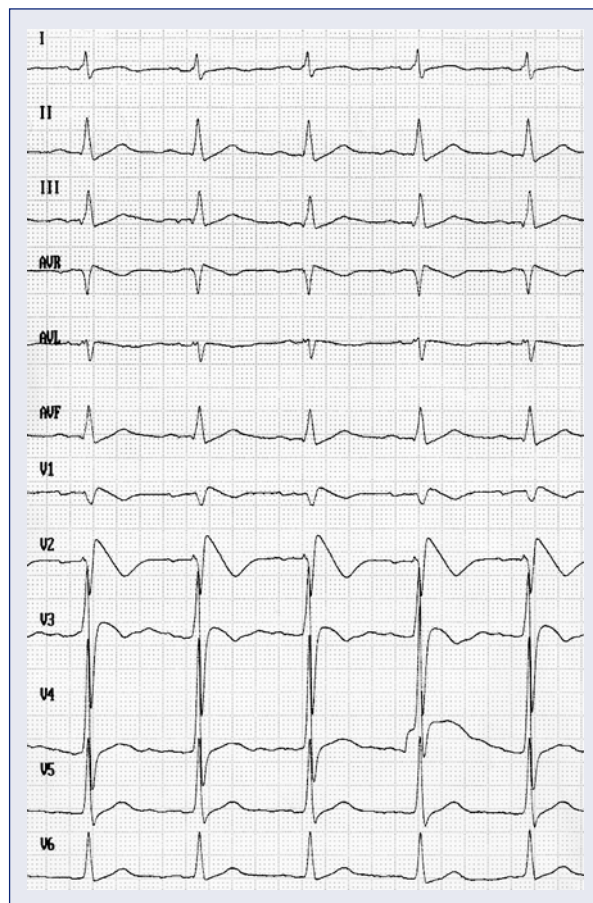


Figure 2. Twelve-lead electrocardiogram showing normal sinus rhythm and typical Brugada pattern type 1 (coved-type).

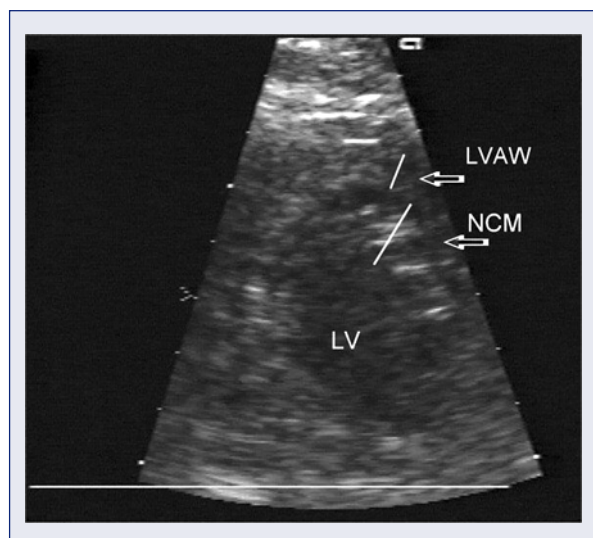


Figure 3. Transthoracic two-dimensional echocardiogram in short axis showing markedly thickened endocardium with noncompacted (NCM) and compacted (LVAW) layers; LV — left ventricle.

compacted myocardium was 2.0, which accords with the Oechslin diagnostic for LVNC [10].

Coronary angiography revealed normal coronary arteries, and 24-hour Holter monitoring showed sinus rhythm with a lowest heart rate of 40 bpm during the day and 28 bpm at night.

A dual-chamber cardioverter-defibrillator (Tachos DR, Biotronik, Germany) was implanted. VF detection zone (< 260 ms), and two VT zones (< 300 ms, < 350 ms) were programmed. Programmed ICD therapy included shocks on VF, and antitachycardia pacing (ATP) followed by shocks on VT. The patient was discharged home on pharmacological treatment: quinapril, metoprolol, insulin and metformin. On one month follow-up, a high ventricular pacing threshold was diagnosed. Temporary steroid therapy was implemented.

Five months later, he developed arrhythmic storm due to multiple episodes of monomorphic VT. Amiodarone was started. Because of the recurrence of a high ventricular pacing threshold (> 5 V, 0.4 ms), an additional pace/sense lead was implanted.

Over the next six months he experienced several inappropriate ICD therapies (shocks and ATP) caused by AFL with fast ventricular response. Cavotricuspid isthmus ablation was performed. Three months later, however, three consecutive inappropriate ICD shocks due to AF and atypical AFL were documented. The patient refused left atrial ablation, thus modification of atrioventricular (AV) node with prolongation of AV conduction to 300 ms was performed. For the 18 months following ICD implantation, he presented permanent AF. Acenocoumarol was added to his pharmacological regimen.

During the next follow-up, episodes of monomorphic VT (in fast VT zone) successfully terminated by ATP or cardioversion were observed. The follow-up echocardiographic studies revealed a constant progression of the left ventricular dysfunction with a decrease of ejection fraction to 35% and increase of left ventricular end-diastolic diameter to 71 mm on last visit (three years after ICD implantation). Moreover, in the apical region of anterior and lateral walls, akinesis and slight thinning of the noncompact layer were found. The patient was screened for cardiac resynchronization therapy, but no signs of inter- and/or intraventricular dyssynchrony were found.

Discussion

Left ventricular noncompaction may coexist with various ECG abnormalities such as ST segment depression, negative T-wave, bundle branch blocks, pathologic Q-wave, sinus bradycardia, Wolff-

-Parkinson-White syndrome and atrial arrhythmias [6, 10, 11]. Malignant ventricular arrhythmias are common in LVNC (40%). About 50% of patients die suddenly [6, 10].

To the best of our knowledge, this is the first report of the coexistence of LVNC and Brugada syndrome. Both pathologies present in their clinical symptomatology as supraventricular and ventricular arrhythmias [6, 8, 10]. Most patients at the time of LVNC diagnosis have left ventricular systolic and/or diastolic dysfunction; and during follow-up, half of them develop severe heart failure [10].

The most pronounced contraction abnormalities were found in our patient in the apical region of anterior and lateral walls, thus in the noncompact parts of the left ventricle. The pathophysiological mechanisms of heart failure and ventricular arrhythmias in patients with LVNC are unclear. Coronary microcirculation dysfunction and ischemia may play a role in the progression of the disease [12]. In our case, paroxysmal AFL and AF were additional factors predisposing to faster heart failure progression. Documented fast VT (250 bpm) (Fig. 1) was differentiated with AFL with 1:1 AV conduction and intraventricular aberration. Intracardiac recordings from double-chamber ICD were helpful, and showed a clear difference between AFL, which presented a regular AV relationship, and VT with ventriculoatrial block. Episodes of fast regular tachycardia with wide QRS complexes of the same morphology after cavotricuspid ablation and AV node modification supported the statement that this tachycardia is not an atrial flutter.

Genetic testing for Brugada syndrome corresponded to a positive result of previously unknown mutation (type 2). It meant that the patient had a genetic defect potentially responsible for the disease. To assess whether this mutation causes Brugada syndrome, it would be helpful to screen other family members. Unfortunately, this, and the genetic testing for LVNC, could not be performed.

The described case could be an example of coexistence of two rare diseases of various genetic patterns and pathogenesis that only partially showed overlapping symptomatology and complications. In a given case it is difficult to say which pathology is responsible for the malignant ventricular arrhythmias. The secondary prevention of sudden cardiac death is of paramount importance.

Despite major progress in diagnosing and identifying the cellular mechanisms responsible for the development of Brugada syndrome in particular, no major progress as to therapy for that disease has been noted.

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