Case report

A case of arrhythmogenic right ventricular cardiomyopathy—Naxos disease

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KEYWORDS

CMRI
Electrocardiography
Naxos disease
Palmoplantar keratoderma
Ventricular tachycardia

ABSTRACT

We present a case of arrhythmogenic right ventricular cardiomyopathy (ARVC)—Naxos disease. The patient is 21-year-old male with no history of previous heart disease admitted in a private hospital for rhythm disorder in heart. The condition was diagnosed as ventricular tachycardia (VT) and was treated with cardioversion. The patient was referred to our hospital for further evaluation. On examination patient had palmoplantar keratoderma, wooly hair, and dystrophic nails. The cardiovascular system examination was clinically normal. His electrocardiogram showed epsilon wave in lead V1; echocardiography showed hypo-echogenic tissues in the right ventricular (RV) apex and free wall; magnetic resonance imaging (MRI) investigation revealed fibrofatty replacement of RV free wall and dyskinetic RV wall with diastolic outbulging.

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Introduction

Arrhythmogenic right ventricular dysplasia (ARVD) is a cardiomyopathy characterised by fibrofatty degeneration of the myocardium with progressive myocardial dysfunction, electrical instability, and sudden death. It is an inherited disorder associated with arrhythmias and sudden death. Right ventricular (RV) features predominate but left ventricular (LV) involvement can also arise with disease progression and may be the dominant presentation. Arrhythmogenic RV cardiomyopathy exhibits age-related expression. Arrhythmogenic RV dysplasia is familial in 30–50% cases and is typically inherited in a dominant fashion although recessive forms are also recognised. The Naxos disease is a recessive mutation in the gene encoding plakoglobin characterised by arrhythmogenic right ventricular cardiomyopathy (ARVC), a non-epidermolytic palmoplantar keratoderma, and wooly hair. Most frequently involved areas of RV are posterior base, apex, and infundibulum; these are collectively called as the triangle of dysplasia. Magnetic resonance imaging (MRI), ECHO, electrocardiography (ECG), and SAEG are helpful in the diagnosis. Epsilon wave or small high frequency deflection found in the terminal portion of QRS in leads V1–V3 may be present.

We present a case of ARVC–Naxos disease with ECG, echocardiographic, and cardiac magnetic resonance imaging (CMRI) features of ARVC.

Case history

Our case is a 21-year-old male with no history of previous heart disease, who presented with ventricular tachycardia (VT) of left bundle branch block (LBBB) morphology (Figure 1A) and got treated with dilated cardiomyopathy (DC) cardioversion. The patient was referred to the Government Rajaji Hospital, Madurai for further investigation and management. His ECG during sinus rhythm showed epsilon wave in lead V1 (Figures 1B and C). On examination he had wooly hair (Figure 2) and palmoplantar keratoderma (Figure 3). His cardiovascular system was clinically normal. We proceeded with MRI of heart which showed fibro-fatty replacement of RV free wall (Figure 4). Dyskinetic RV wall with diastolic outbulging was also seen. Echocardiogram showed dyskinesia and diastolic outbulging in the RV apex and free wall with normal RV systolic function (Figure 5). No obvious demonstrable pathology was seen in the LV. Cardiac valves and pericardium were normal.

Patient was treated with amiodarone and discharged. Since, he developed another episode of VT with a slightly different

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Figure 1 (A) Electrocardiogram showing ventricular tachycardia with left bundle branch block morphology, superior axis. (B) Epsilon wave after reversion to sinus rhythm. (C) Epsilon wave.

Figure 2 Woolly hair.

Figure 3 Plantar-keratoderma.

LBBB morphology reverted with DC cardioversion, a detailed electrophysiologic evaluation was planned.

Discussion

Arrhythmogenic right ventricular cardiomyopathy is predominantly a genetically determined heart muscle disorder characterised pathologically by fibrofatty replacement of the RV myocardium. In the early stage of the disease structural changes may be absent or subtle and confined to the localised region of RV typically the inflow tract, outflow tract or the apex of the RV collectively called as the triangle of dysplasia.

The disease expression is variable. During the early concealed phase individuals are often asymptomatic but nonetheless and at a risk of sudden cardiac death notably during exertion.¹ In the overt electrical phase individuals present with symptomatic arrhythmias and RV morphological abnormalities are readily discernible by conventional imaging. In our case, the patient entered the overt electrical phase and presented with VT of LBBB morphology which arose from the RV free wall. Morphological abnormalities demonstrated with CMRI were fibrofatty replacement of RV free wall and dyskinetic RV wall with diastolic outbulging.² Later, diffuse disease results in biventricular failure where ventricular arrhythmias may or may not be present.

Figure 4 Cardiac magnetic resonance imaging showing dysplastic right ventricular and diastolic outbulging.

Figure 5 Two-dimensional echo apical four chamber showing right ventricular free wall infiltration.

According to the Original Task Force Criteria our case satisfied the following three major criteria needed to diagnose ARVC^{3,4}:

1. Dyskinetic RV wall with diastolic outbulging.
2. Epsilon wave in Lead V1.
3. Sustained VT of LBBB morphology with superior axis.

A recessive form of Naxos disease was first described in families originating from the Greek island of Naxos. Woolly hair appears from birth whereas palmoplantar keratoderma^{5–7} develops during the first year of life when infants start to use their hands and feet. The cardiomyopathy clinically manifests by adolescence and shows 100% penetrance.

This type of ARVD is caused by a mutation of the plakoglobin gene, the product of which is a component of desmosomes and adherens junctions. Desmosomes are major cell adhesion junctions prominent in epidermis and cardiac tissue that are important for rigidity and strength of cells under conditions of mechanical stress desmosomal dysfunction and leads to detachment of myocytes at intercalated discs with progressive myocyte apoptosis. As the regeneration of cardiac myocytes is limited fibrofatty replacement takes place and provides the anatomic basis for progressive cardiac failure, arrhythmias, and sudden death.

The symptomatic presentation is usually with syncope and/or VT of LBBB morphology, as in our case. During a mean follow-up period of 10 years, 50% of patients develop progressive heart disease involving the right or both ventricles. Progression appears to be stepwise in some cases associated with arrhythmic storm or sudden cardiac death. Symptoms of right heart failure appear in the final stages when the right or both ventricles are severely affected.

Young age, malignant family history, QRS dispersion ≥ 40 ms,⁸ T wave inversion beyond V1, LV involvement, VT, syncope or previous cardiac arrest are considered as the major determinants of adverse prognosis and impending sudden death. Different anti-arrhythmics like sodium blockers, sotalol, and amiodarone are used for treatment. Implantable cardioverter defibrillator has been proven to be lifesaving in patients who develop symptoms/or structural progression of disease particularly before age 35 years.^{9,10}

Familial occurrence of a combination of DC with palmoplantar keratoderma and curly hair was first reported in India by Rao et al. in 1996 with no ECG evidence of epsilon wave and VT, and echocardiographic evidence of RV involvement.¹¹

In the present case, the diagnosis of Naxos disease is to be considered with the presence of woolly hair, palmoplantar keratoderma presenting with VT of LBBB morphology with global or regional dysfunction, and structural alterations of RV.

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Book review

Percutaneous mitral valvotomy, 1e. Harikrishnan S. Publisher: Jaypee Brothers Medical Publishers Pvt. Ltd, New Delhi. Publication: 2012. Pages: 474. Paper Back. Price: \$50. ISBN: 978-93-5025-561-2.

Although there has been a lot of literature on mitral valvotomy both from within India and abroad, the new book on percutaneous mitral valvotomy edited by Dr. Hari Krishnan from Sree Chitra Tirunal Institute of Medical Sciences and Technology, Thiruvananthapuram is a valuable addition to our knowledge. The book is a nearly complete encyclopaedia on percutaneous balloon mitral valvuloplasty (PBMV) discussing all its aspects covering anatomy, physiology, pathology, procedure details, and all the new gadgets. The technical details of the procedure are well discussed, and most importantly, it is written in common language and can be read through quickly. With excellent illustrations, the book has contributing authors from all over the world. However, Dr. Allen Cribier's name is surprisingly missing. I strongly recommend this book for all the interventional cardiologists dealing with valvular heart disease.

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