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【 CASE REPORT 】

A Young Patient Presenting with Atrioventricular Block Diagnosed as Myotonic Dystrophy

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Abstract:
We encountered a 42-year-old woman with a history of diabetes mellitus and cataracts presenting with repeated syncope whose electrocardiogram showed advanced atrioventricular block. On admission, we excluded major potential differential diagnoses as causes of an atrioventricular block but did not suspect myotonic dystrophy, which was eventually diagnosed by chance based on a suspected weakness of the respiratory muscles followed by a detailed neurological physical examination. Myotonic dystrophy should be suspected as a differential diagnosis when relatively young patients present with conductance disorder.

Key words: cardiac sarcoidosis, pacemaker, heart failure, myotonic dystrophy

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Introduction

Myotonic dystrophy is a relatively rare autosomal dominant genetic disease presenting with myotonia and progressive muscle weakness accompanied by cataracts, cardiac disease, and endocrine disease (1). As comorbid cardiac diseases, atrioventricular block and cardiac sudden death are reported.

We herein report a woman who presented with atrioventricular block and was eventually diagnosed with myotonic dystrophy type 1.

Case Report

A 42-year-old woman with a history of type 2 diabetes mellitus (dependent on insulin therapy for over 10 years) and cataract surgery 12 years earlier visited our clinic complaining of undifferentiated dizziness for the past several years and syncope for several months. As her electrocardiogram showed 2:1 advanced atrioventricular block with a heart rate of 30 beats per minute, she was admitted to our institute to have the etiology of her atrioventricular block investigated and pacemaker implantation considered.

Her father and brother both had a history of bradyarrhythmia (Fig. 1). She had received anagliptin 200 mg per day orally and a total of 44 units of insulin subcutaneous infusion per day. Her height was 164 cm, and her body weight was 67.5 kg. On admission, HbA1c [National Glycohemoglobin Standardization Program (NGSP)] was 12.4%, and her blood glucose level was 427 mg/dL. Plasma B-type natriuretic peptide was 52 pg/mL, troponin I was 8.9 pg/mL, troponin T was 0.065 ng/mL, and serum potassium concentration was 5.3 mEq/L. A blood gas test showed pH 7.38, partial pressure of carbon dioxide in arterial blood ($PaCO_2$) 56.4 torr, partial pressure of arterial oxygen (PaO_2) 79.5 torr, and HCO_3 32.6 torr.

An electrocardiogram showed sinus trigeminal pulse with an advanced atrioventricular block including a first-degree atrioventricular block, complete right bundle branch block, and left anterior hemi-block in which conduction disorder had progressed compared to her previous electrocardiogram (Fig. 2). A Holter electrocardiogram captured 3.3 seconds of sinus arrest. Transthoracic echocardiography showed a left ventricular end-diastolic diameter of 55 mm with an ejection fraction of 69%.

Screening tests including coronary angiography, cardiac magnetic resonance imaging, and gadolinium scintigraphy

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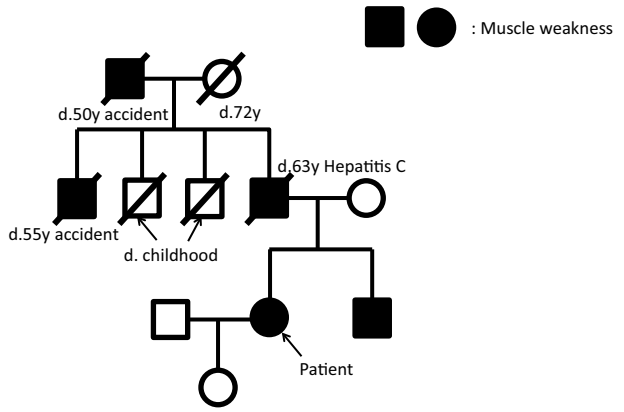

Figure 1. **Family tree with muscle atrophy. Muscular weakness has been noted in the paternal family of the patient. d, age of death.**

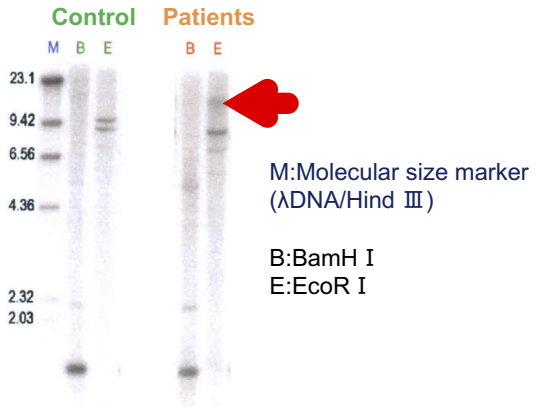

Figure 3. **Genetic test demonstrating the evidence of myotonic dystrophy. λDNA/Hind is used as a molecular size marker (M column). Southern blot analyses of the DMPK gene using restriction enzymes [BamH I (B column) and EcoR I (E column)]. Approximately 1,400-1,500 repetitive sequences of CTG were observed when EcoR I was used as a restrictive enzyme.**

did not reveal any specific etiologies of atrioventricular block. The intravenous administration of 2 mg midazolam in order to perform bronchoscopy to exclude cardiac sarcoidosis caused the cessation of natural breathing, which required temporary mechanical respiratory support.

Given her suspected respiratory muscle weakness, we consulted a neurologist. A detailed neurological physical examination clarified a hatched and myopathic face, eyelid ptosis, decreased bilateral grasping power, bilateral grip myotonia, and bilateral percussion myotonia. Given these findings, we suspected of myotonic dystrophy type 1, which was eventually diagnosed by genetic testing showing prolongation of corrected transposition of the great vessels (CTG) code repeats (approximately 1,500 times; Fig. 3). Following implantation of a pacemaker for atrioventricular block, we comprehensively explained to her the diagnosis and its prognostic impact on her and her relatives. She started rehabilitation to improve her muscular strength.

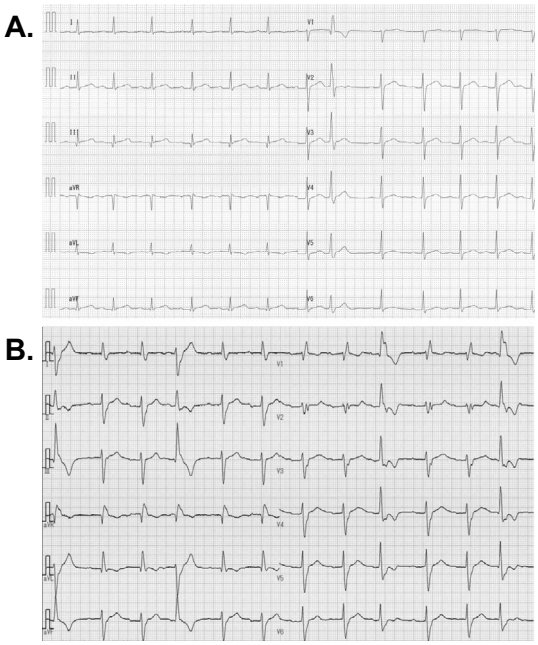

Figure 2. **(A) An electrocardiogram obtained at 31 years old showing sinus rhythm with first-degree atrioventricular block. (B) An electrocardiogram obtained on admission showing sinus trigeminal pulse with advanced atrioventricular block including first-degree atrioventricular block, complete right bundle branch block, and left anterior hemi-block.**

Discussion

Myotonic dystrophy

Myotonic dystrophy type 1 develops in 2.1-14 per 100,000 persons and is one of the most frequent genetic myopathies, presenting with myotonia and progressive systemic muscle weakness accompanied by cataracts, cardiac disease, and endocrine disorder (1), which were all observed in our patient.

Among patients with myotonic dystrophy type 1, the prolongation of CTG repeat (over 50-2,000 times), which is located on the DMPK gene, activates several associated proteins including CUGBP1 and MBNL1-3, which cause genetic abnormalities of cardiac troponin I, insulin receptor, and muscle-specific chloride channel (2).

Cardiac comorbidity:

Cardiac sudden death is one of the major causes of mortality in patients with myotonic dystrophy, particularly those with supraventricular tachyarrhythmia or any other electrocardiogram disorders (3, 4). Cardiac conduction disorder, dominantly due to His-Purkinje disorder, is one of the major cardiac comorbidities associated with myotonic dystrophy (5).

When encountering a patient with conductance disorder, we should investigate the etiology, as we did, including ischemic heart disease, cardiomyopathy due to sarcoidosis or

amyloidosis, electronic disorder including hyperkalemia, and medications that delay atrioventricular conductance (e.g. calcium channel blockers). In general, screening for cardiac sarcoidosis is therefore highly recommended in young patients.

In this case, we excluded the above diseases but did not suspect myotonic dystrophy, which was diagnosed by chance based on suspected weakness of the respiratory muscles. Myotonic dystrophy may be a differential diagnosis that should be suspected when relatively young patients present with conductance disorder, as we experienced. Of note, comorbidities of early-onset diabetes mellitus and cataracts as well as a family history of bradyarrhythmia, as our patient had, are additional clues suggesting myotonic dystrophy.

Management of arrhythmia:

The gold-standard therapy for conductance disorder in patients with myotonic dystrophy is device implantation. The indication of an intra-cardiac defibrillator as the primary means of prevention remains controversial, although several authors have reported its utility in patients with a reduced cardiac function (6-8). Wahbi et al. showed that the age, family history of sudden death, and presence of left bundle branch block were independent predictors of sudden death based on data from 1,388 patients with myotonic dystrophy type 1 in their retrospectively study (9). In addition, sudden cardiac death may result from ventricular tachycardia, arising from the left anterior or posterior fascicles (7, 9).

The preserved cardiac function, absence of ventricular tachyarrhythmia, and the absence of a family history of sudden death were considered to indicate a low risk of sudden death, so we did not implant an intra-cardiac defibrillator in our patient.

Diagnostic and therapeutic strategy of myotonic dystrophy:

Although a novel agent that decomposes RNA with prolonged repeated gene has been developed (10, 11), no clinically available definite therapy for treating myotonic dystrophy has yet been established. Nevertheless, the early diagnosis of myotonic dystrophy is required for the appropriate prognostic prediction, rehabilitation, and arrangement of orthosis in order to prevent muscle weakness, as well as genetic screening for patients' relatives, if required.

The authors state that they have no Conflict of Interest (COI).

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