Familial Sick Sinus Syndrome With Atrioventricular Conduction Disturbance

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A family with sick sinus syndrome is presented: a mother and her 2 daughters affected with sinus node dysfunction. Electrophysiological studies revealed abnormal atrioventricular conduction in the 2 daughters. All 3 individuals were implanted with a permanent pacemaker to relieve their symptoms. Endomyocardial biopsy from the right ventricle of one daughter showed disarrangement, degeneration, myocyte necrosis and interstitial fibrosis suggestive of myocardial disease. (Jpn Circ J 1998; 62: 788–790)

Key Words: Atrioventricular block; Cardiomyopathy; Genetic disease; Sick sinus syndrome

Sick sinus syndrome is characterized by symptoms derived from persistent spontaneous sinus bradycardia, sinus arrest and/or alteration of paroxysms of atrial tachyarrhythmias and associated sinoatrial and/or atrioventricular conduction disturbances. Although the cause is not definable in the majority of cases, some cases are reported to be caused by coronary artery disease, cardiomyopathy, and surgical injury to sinus nodal tissue. Familial occurrence of this syndrome with or without atrioventricular conduction disturbance is a well-recognized clinical entity, but rarely reported. Here, we present a family with symptomatic spontaneous sinus bradycardia without any apparent organic disorders. Two members of the family showed atrioventricular conduction disturbance. All of these patients required permanent pacemaker implantation.

Case Reports

The eldest of the 2 daughters suffered from spontaneous syncopal attacks in 1982, when she was 8 year old. An electrocardiogram (ECG) showed sinus bradycardia with junctional escape beats associated with her symptoms. The maximum pause of ventricular contraction was 6.5 sec (Fig 1). Electrophysiological studies showed prolongation of corrected sinus recovery time (5.8 sec) and normal atrioventricular conduction. She was implanted with a permanent pacemaker during this hospitalization. In 1986, sustained atrial flutter was noted and the generator was replaced with an antitachycardia pacemaker. An electrophysiological study revealed maximal sinus node recovery time longer than 10.0 sec and atrioventricular conduction impairment (AH time, 170 msec; HV time, 55 msec; AV Wenckebach point 110/min). Echocardiography showed no abnormality.

The mother experienced repeated fainting attacks in January of 1996 at age 54. Her ECG was found to be abnormal (sinus bradycardia, heart rate approximately 40 beats/min). Holter ECG showed frequent sinus arrest up to 6.2 sec (Fig 2). She was diagnosed as having sick sinus syndrome and a permanent pacemaker was implanted. Since then her fainting attacks have ceased.

The younger sister experienced repeated fainting attacks in March of 1996 at age 20. She noticed that her symptoms were similar to those of her mother and older sister. She was admitted to hospital for evaluation of her symptoms. ECG revealed that her basal rhythm was sinus bradycardia (heart rate 31 beats/min) and the PR interval was prolonged to 0.24 sec. An electrophysiological study was performed. Maximum sinus arrest of 4.5 sec was recorded after rapid right atrial pacing (Fig 1). Atrioventricular conduction was determined to be impaired as evidenced by the occurrence of Wenckebach type AH block after atrial pacing at a rate of 100/min. Endomyocardial biopsy of the right ventricle revealed disarrangement, degeneration, myocyte necrosis and interstitial fibrosis (Fig 2). Diagnosed as having sick sinus syndrome, this patient was implanted with a permanent pacemaker. She has been free of her symptoms since then.

As far as we investigated, neither parents nor siblings of the mother showed faintness or syncope, but their ECGs could not be obtained.

Discussion

All of the family members presented here showed sinus node dysfunction. None had experienced acquired myocardial diseases, which cause sinus node disease, and echocardiographic study excluded the possibility of structural cardiac disease. It is therefore reasonable to assume that the origin of the disease is hereditary and the prevalence of affected individuals suggests autosomal dominant inheritance. Cases of families with sinus node dysfunction have been reported; however, the combination of sinus node dysfunction and atrioventricular conduction disturbance is extremely rare. It is recommended that both sinus node and atrioventricular conduction function should be investigated in patients with a familial history of cardiac disease.
in order to establish a precise diagnosis.

The histopathological features of this familial disease have not been reported. Right ventricular biopsy was performed in one of the patients and the specimen revealed disarrangement of myocardial fibers, degeneration and interstitial fibrosis. Although the relationship between these changes and the clinical characteristics of the disease in these family members remains unclear, the pathological findings strongly suggest that sinus node dysfunction and atrioventricular conduction disturbance are caused by myocardial disease. It is reasonable to assume that the electrophysiological abnormality observed in this family could be caused by hereditary myocardial disease. This is the first histopathological characterization of familial sick sinus syndrome. The arrhythmia-conduction disturbance type of cardiomyopathy characterized by cardiac arrhythmias and conduction disturbance without evidence of myocardial dilatation or hypertrophy has been described and this type of cardiomyopathy may be present intrafamilially. In a series of 573 endomyocardial biopsies in patients with cardiomyopathy, 14.8% of patients were determined to fall into this category.

Recently it was reported that mice harboring an alpha-myosin heavy chain missense mutation experienced histological and hemodynamic abnormalities characteristic of familial hypertrophic cardiomyopathy, and electrophysiological abnormalities including heterogeneous ventricular conduction properties and prolonged sinus node recovery time. Although the association between the animal study and the family presented here is not clear, the genetic background of the family should be further studied in this regard.

References

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