Circ J 2006; **70:** 147 – 149

Newborn Infant With Maternal Anti-SSA Antibody-Induced Complete Heart Block Accompanying Cardiomyopathy

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Newborn case of maternal anti-SSA antibody-induced congenital complete heart block (CCHB) accompanying cardiomyopathy is presented. Unexpectedly, she died of ventricular tachycardia, not bradycardia, 6 days after birth. Autopsy revealed left ventricular cardiomyopathy with endocardial fibroelastosis. Thus, when evaluating fetal cardiac performance in cases of maternal anti-SSA antibody-induced CCHB, it is necessary to pay attention to myocardial attributes such as endocardial hyperplasia. (*Circ J* 2006; **70:** 147 – 149)

Key Words: Anti-SSA antibody; Cardiomyopathy; Congenital complete heart block

Maternal anti-SSA antibody is associated with congenital complete heart block (CCHB),[1–4] and previous reports have described endocardial fibroelastosis or other cardiomyopathies accompanying anti-SSA antibody-mediated CCHB despite adequate pacing.[5,6] A newborn infant with maternal anti-SSA antibody-induced CCHB accompanied by cardiomyopathy has not been reported and we present a pediatric patient with CCHB who died of severe congestive heart failure with cardiomyopathy 6 days after birth.

Case Report

A mother with a fetus at 24 weeks of gestation was admitted to our hospital. The fetal heart rate indicated bradycardia and her mother carried the anti-SSA antibody; 52 kD= 166.6 Index (normal <5.1) and 60 kD=20.1 Index (normal <5.9). Protocols for the enzyme-linked immunosorbent assay using full-length recombinant human 52 kD and 60 kD proteins expressed in Escherichia coli have been described previously[4] Fetal echocardiography at 25 weeks' gestation showed that the total cardiac dimension was 26 mm, the cardiothoracic areas ratio was 36%, atrial heart rate was 132 beats/min, ventricular heart rate was 88 beats/min, and there was mild pericardial effusion. We diagnosed complete atrioventricular block by M-mode fetal echocardiography (Fig 2A). At 27 weeks' gestation, there was thick pericardium and thin myocardium at the apex (Fig 2B), but we considered that cardiac performance was not impaired because hydrops was not evident, the ventricular heart rate was 84 beats/min, the left ventricular (LV) ejection fraction was 56%, and V_{max} was 96 cm/s.[7] After 29 weeks' gestation, fetal echocardiography did not reveal any deterioration. At 32 weeks and 0 days of gestation, an emergency cesarean section was performed after spontaneous rupture of the amniotic membrane, and a female infant weighing 1,626 g was delivered. Apgar score was 8 at 5 min and at 1 min after birth. She had butterfly-like erythema on her face, her atrial heart rate was 160 beats/min, and the ventricular heart rate was 80 beats/min at rest, increasing to 100 beats/min when she cried. Electrocardiography revealed a flattened ST-T wave in leads V_{2-6} (Fig 1A). The LV ejection fraction decreased to 54% and the myocardial structure was coarse on echocardiography. Moreover, the creatine kinase (CK) level was high (484 U/L) in the blood sample taken at birth. These findings indicated severe myocardial damage and she was transferred to the neonatal intensive care unit. One

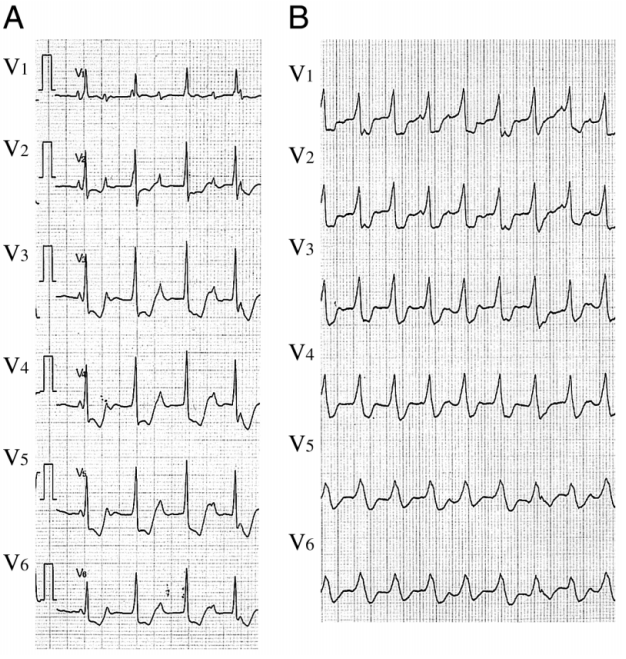

Fig 1. (A) Electrocardiogram at 1 h after birth shows complete atrioventricular block with an atrial heart rate of 180 beats/min and ventricular rate of 80 beats/min. There is also bundle branch block and an abnormal ST-T wave, in particular a broad depressed ST wave extending from V_2 to V_6. (B) Ventricular tachycardia at 1 day after birth, but an unchanged atrial rate at 180 beats/min. The ventricular rate increased to 140 beats/min with a wide QRS.

(Received April 19, 2005; revised manuscript received October 13, 2005; accepted October 19, 2005)

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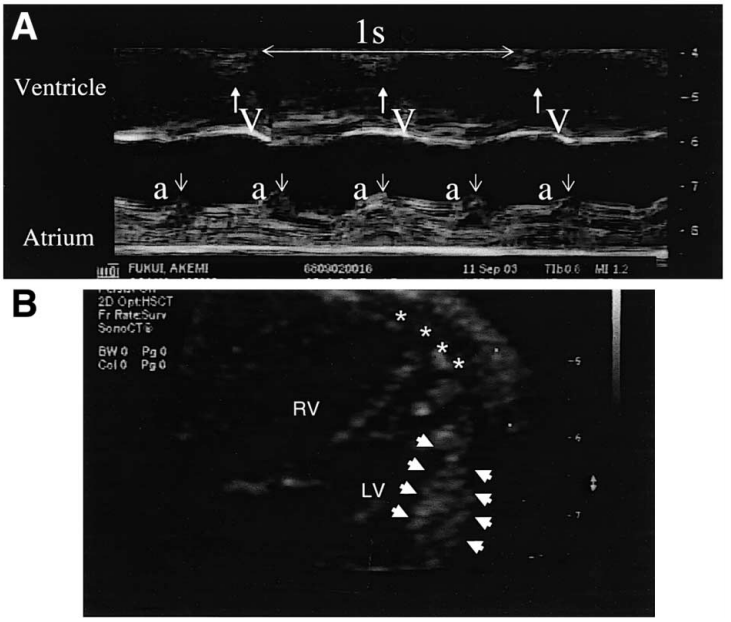

Fig 2. (A) Fetal echocardiography by M mode method shows complete atrioventricular block at 25 weeks gestational age. a, atrial wall motion; V, ventricular wall motion. (B) Fetal echocardiography at 27-weeks gestational age shows thick pericardium (arrow) and thin myocardium at the apex (asterisk). The myocardium is a loose interwoven meshwork of muscle fibers that are supplied directly with blood via the large surface area of the numerous intertrabecular spaces (arrowheads). LV, left ventricular; RV, right ventricular.

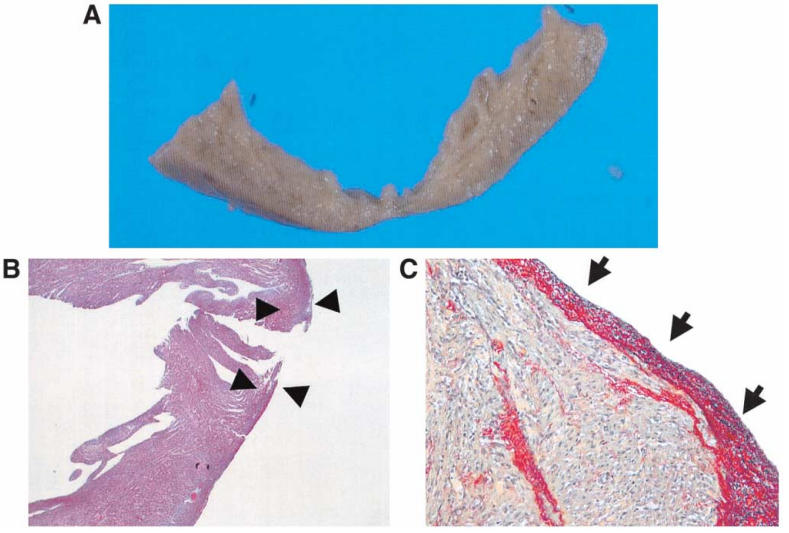

Fig 3. (A) Autopsy shows the thin myocardium and thick endocardium of the left ventricular (LV) apex. (B) Microscopic examination confirms the very thin myocardium of the LV apex (arrows). (C) Elastica van Gieson stain shows the elastic tissues in the thickened pericardium, but neither dysmorphic myocardium nor inflammatory cells can be seen (arrows).

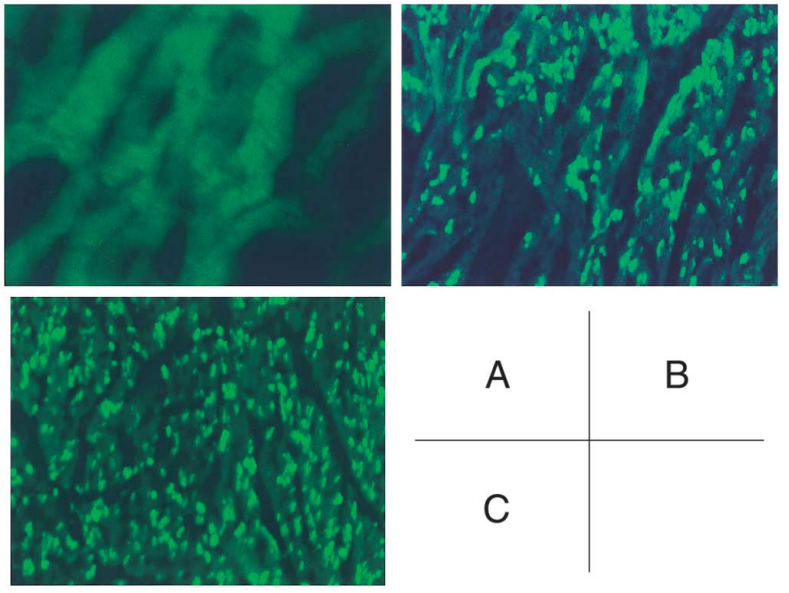

Fig 4. Immunohistochemical analysis of frozen cardiac muscle from the left ventricle. IgA, IgM, IgG and C3D are strongly positive. (A) IgA staining in the control (×40), (B) IgA staining in the frozen cardiac muscle (×20), (C) IgG staining in the frozen cardiac muscle (×20).

day after birth, theophylline therapy was begun for apnea attacks, which subsided but her heart rate increased to 140 beats/min, the wave form of QRS became wide and the LV ejection fraction decreased to 40% (Fig 1B). Theophylline was immediately discontinued, but her clinical symptoms worsened, including decreased blood pressure, anurea, and aggravation of metabolic acidosis. The serum concentration of theophylline was within the normal range at 6.2 μg/ml at the time when ventricular tachycardia occurred with the complication of grade IV intraventricular hemorrhage. On the 6th day after birth, she died of progressive intraventricular hemorrhage.

Autopsy showed a thin myocardium and thickening of the endocardium at the LV apex. Microscopic examination revealed that the myocardium at the LV apex was very thin. Moreover, the endocardium had extremely thick elastic fibers. Some of the cardiac muscle showed degeneration and necrosis, but neither dysmorphic myocardium nor inflammatory cells was observed in tissue from the LV apex (Fig 3). In the conduction system, only the atrioventricular node was denatured and fibrotic; the sinoatrial node and His bundle were unaffected.

There was widespread endocardial fibrosis in the left ventricle around the apex and immunohistochemical analysis of frozen cardiac muscle from the left ventricle showed positive staining for IgA, IgM, IgG and C3D (Fig 4).

Discussion

Although there are cases of maternal anti-SSA antibody-induced endocardial fibroelastosis or other cardiomyopathy accompanying CCHB, those cases occurred after pacemaker implantation[5,6] Therefore, it has been suggested that endocardial fibroelastosis in patients with CCHB is a secondary phenomenon following the long-standing heart block, bradycardia, and congestive heart failure. In the present case, thick pericardium and thin myocardium at the apex were detected at 27 weeks of gestation and no further change was observable at 32 weeks. Therefore, because the ventricular heart rate was more than 80 beats/min without congestive heart failure, we considered the myocardial aberrations of this case to be primary rather than secondary changes.

We diagnosed cardiomyopathy with endocardial fibroelastosis, based on the pathological findings of thickened endocardium of the left ventricle with extremely thick elastic fibers, without the presence of either dysmorphic myocardium or inflammatory cells (Fig 3). Depressed LV systolic function and endocardial clot with systemic remobilization and ventricular arrhythmia are important risk factors of cardiomyopathy[7,8] and most neonatal CCHB patients die of congestive heart failure with severe bradycardia. However, the present patient died of ventricular tachycardia, not bradycardia, which we consider was the result of the rapid deterioration of cardiac performance after birth because of cardiomyopathy. Therefore, fetal cardiac performance in cases of maternal anti-SSA antibody-induced CCHB should be evaluated because the cardiac muscle cells may be damaged as well. However, there are few methods of evaluate fetal cardiac performance and furthermore, exact evaluation becomes difficult when there is an arrhythmia. Therefore, when evaluating cardiac performance in the fetal period, it is necessary to pay attention to myocardial attributes such as endocardial hyperplasia.

CCHB with cardiomyopathy has not yet been reported in the fetal period. Antibodies belonging to the IgG class can cross the placental barrier and enter the fetal circulation at an unknown time during pregnancy, although the onset has been reported as early as week 16 and week 23[10] Thus, both the onset of cardiomyopathy and the appearance of antibodies could occur in the early period of pregnancy. The mother of this case had a high-index 52 kD anti-SSA antibody and pericardial effusion. Furthermore, immunohistochemical analysis of the thin myocardium of the LV apex was positive. These findings suggest that maternal anti-SSA antibody may affect the fetal pericardium as well as the myocardium. Nield et al reported 3 cases of endocardial fibroelastosis in the absence of CCHB among the offspring of mothers with autoantibodies and hypothesized that endocardial fibroelastosis with myocardial dysfunction is attributable to diffuse cardiac damage induced by maternal autoantibodies. Alternatively, the maternal anti-SSA antibody may inhibit the elaboration of the left ventricle by causing myocardial damage.

The findings of the case suggests an important point: that the pancarditis caused by maternal anti-SSA antibodies includes the development of cardiomyopathy as well as atrioventricular block.

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