Case Report

Painless Myocardial Infarction in Identical Diabetic Twins

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A pair of 37-year-old identical twins with diabetes mellitus are described. One of the brothers was admitted for heart failure without pain, and autonomic neuropathy was found. The clinical diagnosis was inferior myocardial infarction with anteroseptal healed myocardial infarction. Cardiac catheterization revealed triple coronary vessel involvement. The diagnosis was confirmed at autopsy after sudden death. The other brother was also examined by cardiac catheterization, which revealed total right coronary occlusion and hypokinesis of the wall. There had been no previous pain nor upper body discomfort until that time in either twin. Thus, genetic factors should possibly be considered in the genesis of asymptomatic or silent myocardial infarction.

Key words: Identical twins, Diabetes mellitus, Neuropathy

Painless or unrecognized myocardial infarction is reported to be more frequent than once thought. It has also been emphasized out that the prognosis in unrecognized infarction is similar to that in recognized infarctions (1). Regarding the cause of painless or unrecognized myocardial infarction, several possibilities have been considered, such as a defective anginal warning system (2), an elevated pain threshold or diabetic sensory neuropathy (3). The contribution of genetic factors has also been suggested (4). Here we report identical twin brothers with non-insulin dependent diabetes mellitus (NIDDM), one with painless, and the other with totally asymptomatic myocardial infarction.

CASE REPORT

Case 1: A 37-year-old man was referred to the Maebashi Hospital with a diagnosis of acute myocardial infarction. The evening before admission, the patient had drunk alcohol before going to bed, dyspnea occurred at midnight and he had been unable to sleep thereafter. There was no chest pain. An electrocardiogram taken on the morning of admission showed a deep Q wave, ST elevation in II, III and aVF and poor progression of R waves in the right precordial leads (Fig. 1). He was sent to the hospital under a diagnosis of acute inferior infarction and possibility of anterior infarction. NIDDM had been diagnosed 8 yr before, however it was not well controlled. The patient had smoked 10–15 cigarettes per day for over 10 yr. There was no history of hypertension. His father and twin brother also had NIDDM.

The patient had gained wt over the previous year, and had become obese. He was 167 cm tall and weighed 73 kg. Blood pressure was 94/60 mmHg, heart rate 110/min and respiration 20/min. Auscultation of the lungs revealed bilateral moist rales. The apical impulse was laterally displaced. The margin of the liver was palpable three finger breadths below the right costal margin. Physical examination revealed congestive heart failure.

The peak serum creatine kinase level was 2,901 IU/L. A chest X-ray film showed enlargement of the heart and pulmonary congestion. Telemetry data indicated repeated ventricular premature conduction

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Fig. 1. Case 1. ECG on admission in April 1988 showing an abnormal Q with ST segment elevation in II III and aVR leads, and poor progression of R wave in precordial leads. ECGs by single master exercise showed positive evidence of ischemic heart disease without pain in V4–6 leads. Apr, April '88, May before, ECG before exercise, May after, ECG after exercise.

(short run) for several days after the onset of myocardial infarction. Examination of the optic fundi disclosed a Scott IIIb lesion. Urinalysis showed a +++ test result for glucose and a ++ test result for protein. At 21 days after onset, the fasting plasma glucose level was 231 mg/dl, plasma HbA1c 10.7%, serum cholesterol 189 mg/dl, HDL-cholesterol 21 mg/dl, triglyceride 121 mg/dl urea nitrogen 28 mg/dl. The HLA type was B35/51, Cw3, and DR2, DRw8.

The beat-to-beat variation of the heart during deep breathing was reduced, as seen in Fig. 2, suggesting cardiac autonomic neuropathy. Coronary arteriography performed 30 days after admission revealed severe three-vessel disease. Left ventriculography revealed akinesis of the inferior wall and severe hypokinesis of the anterior wall. The left ventricular ejection fraction was 28% (Fig. 3).

After the onset of myocardial infarction, the patient was given medication (nitrates, anti-arrhythmic agents, calcium antagonists, anti-diabetic drug) and lost 5 kg over a period of 59 days. However at 59 days after admission, he died suddenly in bed. The cause of death could not be identified.

At autopsy, the anterior wall of the left ventricle of the heart was thin and had massive fibrosis. There was also patchy necrosis in the posterior wall (Fig. 4). Moreover, arteriolar nephrosclerosis and glomerulosclerosis, caused by advanced diabetes mellitus, were found.

Case 2: The twin brother of Case 1 came to the Saiseikai Hospital following his brother's sudden death, though he was asymptomatic, thinking that he may have a similar condition to that of his brother. His NIDDM was well controlled and he did not smoke cigarettes. There was no history of
Fig. 3. (a) Case 1. Cardiac angiography shows 90% stenosis (arrow mark) of the right coronary artery (RCA), 99% proximal LAD stenosis (arrow) and 95% stenosis of the circumflex artery, confirming triple-vessel disease. CAG, coronary angiography; RCA, right coronary artery; LCA, left coronary artery. (b) Left ventriculography in Case 1 demonstrates severe hypokinesis of the anterior wall and akinesis of the posterior wall. LVG, left ventriculography; D, diastolic phase; S, systolic phase.

Fig. 4. Transverse section of heart in Case 1 showing thinned anteroseptal wall (arrows), with by massive fibrosis.

hypertension. He had been diagnosed as having NIDDM 10 yr previously, and had been living with his father and identical twin brother.

Physical findings were unremarkable. He was 166 cm tall and weighed 63 kg. The optic fundi were normal. No signs suggestive of cardiac autonomic neuropathy were observed.

Urinalysis showed a +++ test result for glucose, but a negative test result for protein. The fasting blood glucose level was 264 mg/dl, serum HbAlc 10.8%, serum cholesterol 264 mg/dl, HDL-cholesterol 53 mg/dl, triglyceride 142 mg/dl and urea nitrogen 22 mg/dl. The HLA type was identical to that of his brother. It was verified that the two patients were, in fact monozygotic twins on the basis of their declaration, similar looks and the same HLA
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Fig. 5 (a) Case 2. Coronary angiography shows total occlusion of the right coronary artery. (b) Left ventriculography shows hypokinesis of the posterior wall. LVG, left ventriculography; D, diabetic phase; S, systolic phase

type.

Although the electrocardiographic data were within normal limits, the echoardiographic study revealed a defect in the posterior wall of the left ventricle. Catheterization studies revealed total occlusion of the proximal portion of the right coronary artery and hypokinesis of the posterior wall of the left ventricle (Fig. 5). These findings were consistent with old posterior infarction.

Two yr later, the patient became obese (166 cm tall and 71 kg wt) and was found by his doctor to have diabetic polyneuropathy and nephropathy.

**DISCUSSION**

Both identical twins with NIDDM were found to have severe coronary artery lesions. One had definite acute myocardial infarction associated with respiratory distress but without chest pain. He had never complained of chest pain or discomfort until his death in spite of severe three-coronary-vessel disease. His twin brother was entirely asymptomatic, but the right coronary artery was totally occluded and the echoardiographic and angiographic findings were consistent with old posterior infarction. It was thus very likely that silent myocardial infarction had occurred in Case 2.

Frequent occurrence of silent or painless myocardial infarction in diabetic patients has been reported (5–7). It has also been postulated that silent myocardial infarction might be responsible for many of the sudden deaths of diabetic patients with autonomic neuropathy (8). Faerman and associates (3) reported lesions of the afferent cardiac nerves in diabetic patients with painless myocardial infarction. However, the correlation between cardiac autonomic neuropathy and diabetic complications is not obvious. Although the coronary arteries were affected in both of the present twins, only Case 1
was associated with diabetic triopathy. Because the beat-to-beat variation of the heart during deep breathing were reduced, it was considered that the cardiac autonomic nerves were affected in this case. On the other hand, neither major diabetic complications nor cardiac autonomic neuropathy was associated in Case 2 in spite of clinical evidence of silent myocardial infarction.

The present finding that both of these relatively young identical diabetic twins had severe coronary artery lesions is interesting. Although frequent association of ischemic heart disease with diabetes mellitus is well known, the present cases may suggest the possible contribution of genetic factors in atherogenesis. Faire (4) reported a high prevalence of ischemic heart disease in the other twins when their respective twin had died of this disease. Faire postulated that genetic factors might play an important role in the development of ischemic heart disease. On the other hand, no relationship has been demonstrated between HLA type and development of NIDDM, even in cases of familial premature onset (9). The correlation between HLA type and silent myocardial infarction has not yet been studied.

The concordance rate for NIDDM in identical twins is high (over 50%) in both Japan (10) and England (11). Nelson and Pyke (12) mentioned that such concordance between identical twins is due to genetic factors alone or to the effects of a shared environment, and that any difference in the severity of complications may be due to diabetic control and treatment. Japanese investigators (13) have also obtained similar results.

In both of the present twins, NIDDM had been diagnosed several yr previously (Case 1: 8 yr, Case 2: 10 yr). The brother in Case 1 had obesity, a history of smoking, diabetic retinopathy, polyneuropathy and nephropathy on admission. The other brother (Case 2), when first seen, did not smoke, was not obese and did not have any of these diseases. The NIDDM in Case 1 had not been treated well, but that in Case 2 had been well controlled. The poor prognosis in Case 1 may thus have been due to several complications of uncontrolled NIDDM.

A recent report (14) has mentioned the autonomic neuropathy in NIDDM may be influenced by obesity, and not by the duration of NIDDM, neuropathy or retinopathy.

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REFERENCES