A Case of Dilated Cardiomyopathy Reversed with Conversion of Atrial Fibrillation and β-blocker Therapy

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ABSTRACT. We report here a case of dilated cardiomyopathy reversed with both conversion to sinus rhythm and a consequent long-term β-blocker therapy. The patient was a 47-year-old man with a 3-month history of dyspnea. On admission, electrocardiogram showed atrial fibrillation with a rapid ventricular response. Left ventricular dilatation with markedly diffuse hypokinesis and an estimated ejection fraction of 22% were noted on echocardiogram. Coronary angiography revealed no significant coronary disease. A diagnosis of dilated cardiomyopathy with atrial fibrillation was made, and he was treated with digoxin, diuretics, angiotensin-converting enzyme inhibitors and warfarin. Electrical cardioversion was successfully done, followed by β-blocker therapy. Metoprolol as a β-blocker therapy was given at an initial dose of 5 mg daily and was progressively increased to 40 mg over a four-week period. During the next 6 months, a gradual clinical improvement was found. His echocardiogram performed 20-months later showed that the ejection fraction was 64% with normal left ventricular function. Thus, gradual but complete resolusion of his cardiac dysfunction was noted.

The clinical significance of conversion to sinus rhythm in patients with left ventricular dysfunction complicated by atrial fibrillation was discussed.

Key words: dilated cardiomyopathy — atrial fibrillation — electrical conversion — β-blocker therapy

Atrial fibrillation(AF) has been reported to cause a form of dilated cardiomyopathy(DCM) reversible with conversion to sinus rhythm.[1-4] On the other hand, it has been described that β-blocker therapy was effective in some patients with DCM.[5-7] We report here a case of DCM reversed with conversion of AF and a long term β-blocker therapy.

CASE REPORT

A 47-year-old mail clerk with a history of mild hypertension under treatment visited a clinic for exertional dyspnea. Cardiomegaly and mediastinal mass were noted on the chest X-rey film. Therefore, on May 11, 1995, he was referred to our hospital for further evaluation. On admission, his blood pressure was 140/84 mmHg and heart beat was irregular, 125 beat/min on an

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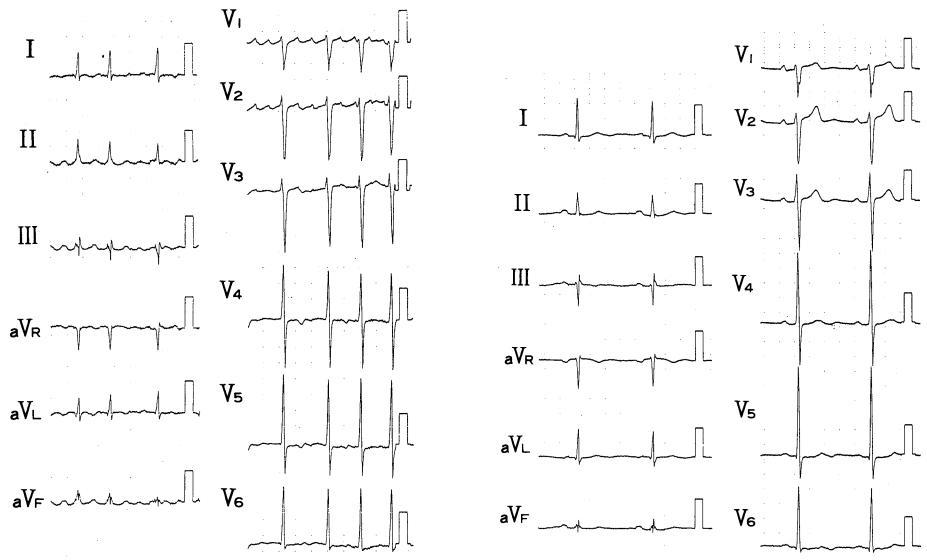

Fig 1. Left: Electrocardiogram on admission showing atrial fibrillation with a rapid ventricular response.
Right: Electrocardiogram after electrical cardioversion showing a restration of sinus rhythm.

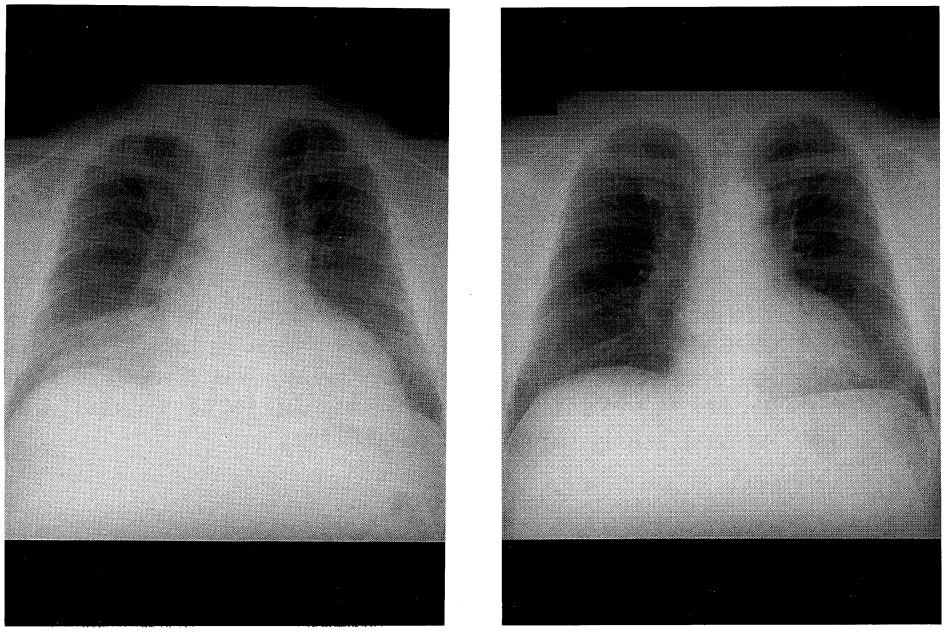

Fig 2. Left: A Chest X-ray film on admission showing a cardiomegaly and a right mediastinal mass adjacent to the right heart border(arrow).
Right: Post-operative chest x-ray film showing a disappearance of the right mediastinal mass.

average. His jugular vein was slightly engorged. Bilateral basilar pulmonary rales and mild leg edema were present. Trivial apical systolic murmur was audible. His abdomen was soft and flat on palpation. An electrocardiogram showed AF with a rapid ventricular response(Fig 1). Chest X-ray film revealed a cardiomegaly and a right mediastinal mass adjacent to the right heart border(Fig 2). Chest computed tomogram and magnetic resonance imaging verified the diagnosis of a mediastinal lipoma. A monphagic pattern on CAP suggesting left ventricular systolic dysfunction and a prominent rapid filling wave on ACG before cardioversion were noted (Fig 3). Echocardiogram demonstrated a diffuse left ventricular hypokinesis with ejection fraction(EF) of 22%(Fig 4). Coronary angiography showed no significant coronary artery stenosis. A diagnosis of DCM with cardiac failure was made and he was treated with digoxin, diuretics, angiotensin-converting enzyme inhibitor and warfarin followed by β-blocker. On β-blocker therapy, metoprolol was administered per os at an initial dose of 5 mg daily and was progressively increased to 40 mg over a 4-week period. His dyspnea was controlled with this regimen. On July 1995, his mediastinal lipoma was surgically removed uneventfully. After the operation, an electrical conversion was successfully done on August 10, 1995. During next 6 months, gradual clinical improvement was made, and his EF was 50% on the echocardiogram 10 months after cardioversion (August 1996). A repeat echocardiogram in June 1997 showed an estimated EF of 65%. Thus, the clinical features of DCM was resolved during 20 months of follow up with return to sinus rhythm.

DISCUSSION

We here present a case of DCM that was reversed with conversion of AF to sinus rhythm. In this case, it was considered that a conversion to sinus

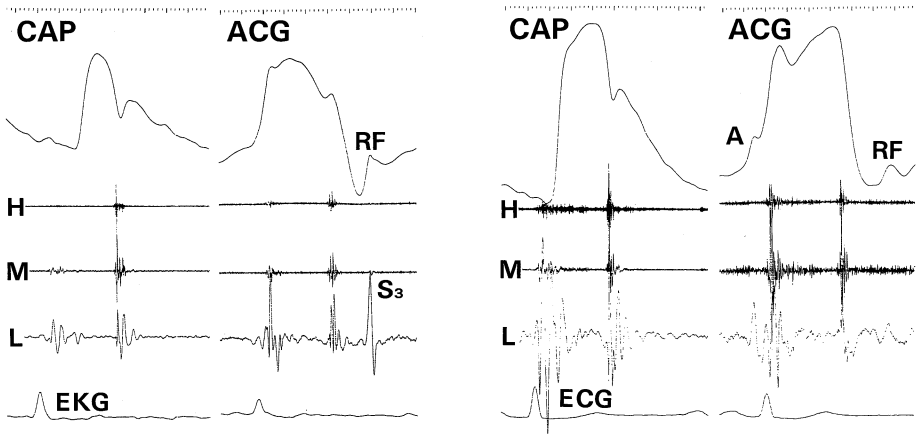

Fig 3. Mechanocardiogram
A monophasic pattern on CAP suggesting left ventricular systolic dysfunction and a prominent rapid filling wave on ACG before cardioversion(left) were noted. ACG after conversion to sinus rhythm combined with β-blocker therapy demonstrated a large A wave and the normalization of rapid filling wave(right)
CAP ; carotid arterial pulse, ACG ; apex cardiogram, H ; high pitch, M ; midium pitch, L ; low pitch, RF ; rapid filling wave, S_3 ; the third heart sound, S_4 ; the fourth heart sound

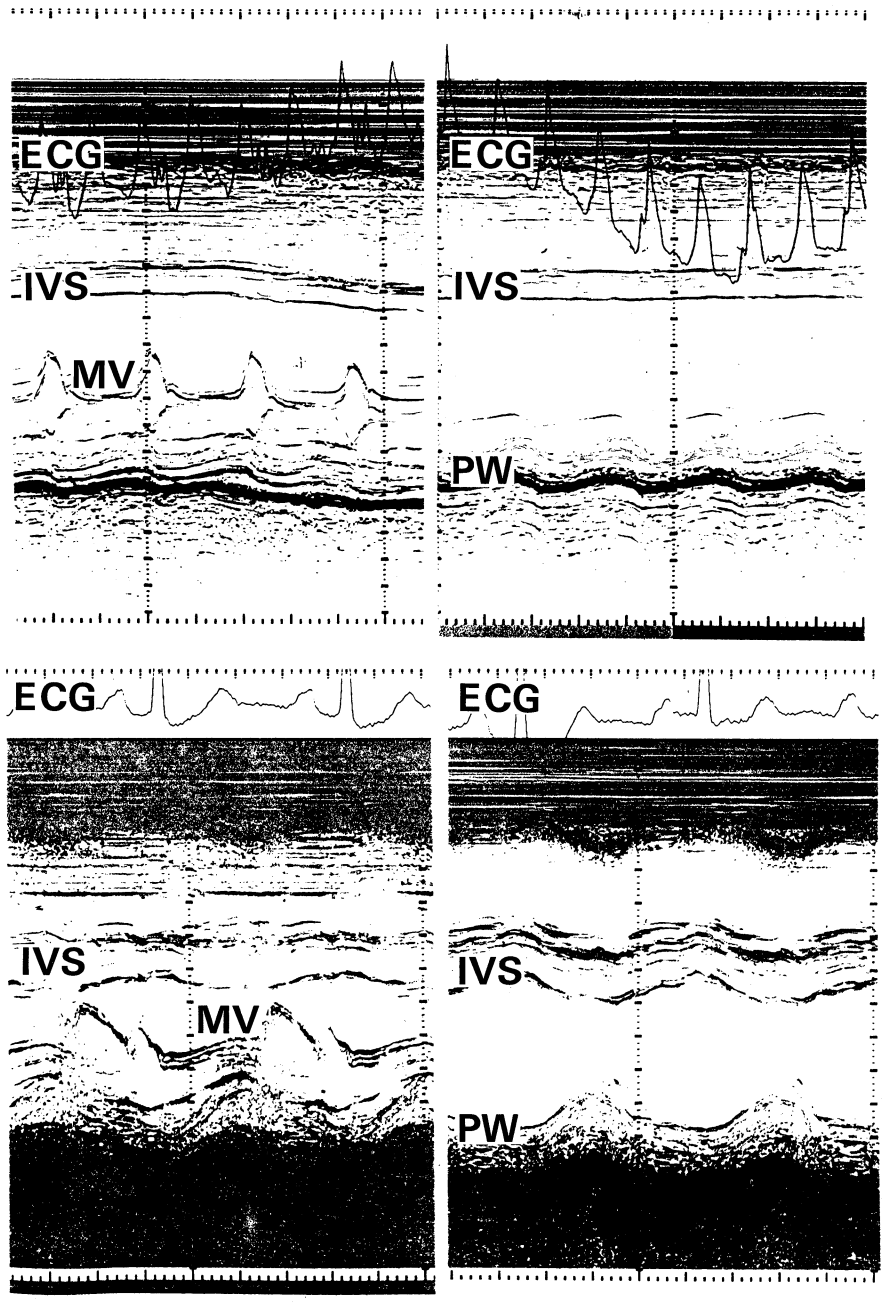

Fig 4. M-mode echocardiogram.
Top: Before cardioversion demonstrating severe left ventricular hypokinesis and widened left ventricular internal diastolic diameter of 6.1 cm, internal systolic diameter of 5.4 cm.
Bottom: Twenty months after treatment: improved left ventricular contraction, left ventricular diastolic dimension is 4.8 cm and left ventricular internal systolic dimension is 3.0 cm.
ECG; electrocardiogram, MV; mitral valve, IVS; interventricular septum, LV; left ventricle, PW; left ventricular posterior wall

rhythm in combination with β-blocker therapy was effective improving left ventricular dysfunction. Grogan *el al*[1] reported 10 cases with AF initially thought to have DCM. In some patients with successful conversion to sinus rhythm, clinical improvement could be brought by the control of heart rate. The authors speculated that the rapid ventricular rate was the primary cause of the left ventricular dysfunction. Van Gelder *et al*[2] reported eight cases with AF who were converted to sinus rhythm. After conversion, EF(mean±SD) improved from 36± 13% to 53± 8%. Kieny *et al*[3] also reported that EF improved significantly in 12 cases successfully converted to sinus rhythm. However, in 5 patients not converted to sinus rhythm, EF did not significantly improve. On the other hand, two patients who were successfully converted to sinus rhythm had a severe deterioration of left ventricular systolic function after recurrence of AF. Kessler G. *et al*[8] reported a case of recurrent DCM reversible on two separate occasions after conversion of AF to sinus rhythm. These observations support the view of that the AF, especially with a rapid ventricular response, is the critical and reversible factors in the developement of a form of DCM. The mechanisms of the left ventricular dysfunction are speculative. Tachycardia itself and/or sympathetic activation which is related to reduction of cardiac output caused by loss of booster function could be major factors in myocardial dysfunction.[9-11] Dilated cardiomyopathy, as seen in this patient, should be kept in mind as a sequence of AF with a rapid ventricular response. Since the trial of β-blocker therapy in 1975 for patients with cardiac failure caused by DCM, various investigations have suggested that β-blocker has benefical effects for some patients with this disease.[5-7] To date, there are only a few studies in regard to the characteristics of patients with DCM who are likely to respond to β-blocker therapy. Schwartz BM *et al*[12] described that patients with rapid heart rate is likely to respond to this therapy. Moreover, Eichohorn *et al*[13] indicate that among patients receiving β-blocker therapy, those with both higher systolic blood pressure and left ventricular end-diastolic pressure showed the most improvement of systolic function after therapy. Therefore, we considered that the control of heart rate was most effective in improving left ventricular systolic dysfunction in this case.

We presented a case which both the heart rate control by cardioversion and β-blocker therapy were thought to be effective in managements of left ventricular systolic function.

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