A Case of Eosinophilic Myocarditis Associated with Cardiogenic Shock

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The patient was a 32-year-old man with a previous history of bronchial asthma. He was admitted with chief complaints of dyspnea and skin rash associated with itching of the palms and soles of the feet, which began 2 weeks earlier. Because of the presence of cardiac failure and increase in the peripheral blood eosinophil count, eosinophilic myocarditis (EM) was suspected. His blood pressure gradually decreased and the patient went into cardiogenic shock. Therefore, endomyocardial biopsy was performed and was immediately followed by corticosteroid therapy and intra-aortic balloon pump (IABP) placement. With the findings of eosinophil infiltration associated with myocardial interstitial edema on endomyocardial biopsy, EM was diagnosed.

In this case, early therapeutic intervention led to resolution of shock resolved and improvement of the peripheral blood eosinophilia and cardiac function; the patient was discharged 33 days after the onset of symptoms. EM is a rare cardiomyopathy in which myocardial eosinophil infiltration is seen. Although it has been perceived as having a mild clinical course, this report described a severe case of EM associated with cardiogenic shock, which improved as a result of early diagnosis and therapeutic intervention.

Key words: eosinophilia, myocarditis, idiopathic hypereosinophilic syndrome

INTRODUCTION

Eosinophilic myocarditis (EM) is a rare disease characterized by myocardial eosinophil infiltration. The myocarditis results from the cytotoxic substances in the eosinophil granules, such as the eosinophilic cationic protein and the major basic protein [1, 2]. The clinical features of EM comprise cardiac failure symptoms, such as chest pain and dyspnea with associated increase in eosinophils in the peripheral blood. The causes of EM are diverse and include allergic diseases; pharmaceutical agents; infection by organisms, such as parasites; and idiopathic [3]. Idiopathic disease is the most common etiology, accounting for approximately half of all the cases [3]. Although EM can become fulminant in some patients, the prognosis is relatively good, with many patients improving in several weeks. The mortality rate in the acute phase is approximately 7% [3, 4]. In this report, we described a case of EM associated with cardiogenic shock in which early administration of corticosteroid therapy in combination with intra-aortic balloon pump (IABP) proved to be lifesaving.

CASE

The patient was a 32-year-old man with a previous history of bronchial asthma. He presented with chief complaints of dyspnea and skin rash on the lower extremities. Two weeks before admission, a pruritic skin rash developed on the palms and soles of the feet. Approximately 1 week before admission, fever and dyspnea developed, prompting the patient to consult the emergency outpatient clinic, where he was diagnosed to have bronchial asthma exacerbation. The patient improved after procaterol inhalation and went home. However, the patient came back on that same day due to worsening dyspnea. Eosinophilia was seen and chest x-ray revealed pulmonary congestion; the patient was, therefore, admitted.

Examination on admission showed that consciousness was lucid; vital signs showed blood pressure of 108/80 mmHg, regular heart rate at 112/min, and a respiratory rate of 22/min. Exudative erythema associated with pain and severe itching was seen on the dorsum of the hands and feet. On auscultation, moist rales and wheezing were heard on the bilateral lower lung fields. The third and fourth heart sounds were audible. No edema of the lower extremities was seen. The findings on blood examination upon admission are shown in Table; white blood cell count was high and the eosinophil fraction and eosinophil count were markedly increased. There were mild elevations of aspartate transaminase (AST), alanine aminotransferase (ALT), lactase dehydrogenase (LDH), and C-reactive protein (CRP) accompanied by elevated troponin T and brain natriuretic peptide (BNP), suggesting cardiomyopathy. The electrocardiogram and chest x-ray are shown in Fig. 1. The basic rhythm was sinus tachycardia and low flat T-waves were seen on the low-voltage and apical leads. Chest x-ray showed cardiomegaly (cardiothoracic ratio, 53%); congestion, particularly in the pulmonary hilum; and infiltrations in the bilateral lower lung fields. Echocardiography Fig. 2 showed a focal decrease in contractility in the posterior wall

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Table Laboratory data on admission

WBC	31.800 /μl	Alb	3.0 g/dl
Neut	28.0%	AST	48 U/l
Lym	6.0%	ALT	46 U/l
Eos	60.0 % (19.080 /μl)	LDH	618 U/L
Mono	4.5%	γ-GTP	68 U/L
RBC	426×10⁴ /μl	BUN	6 mg/dl
Hb	13.4 g/dl	Cr	0.80 mg/dl
Hct	39.7%	Na	144 mEq/L
PLT	43.8×10⁴ /μl	K	3.8 mEq/L
		Cl	107 mEq/L
CRP	5.65 mg/dl	PR3-ANCA	< 10 EU
Troponin I	9.06 ng/ml	MPO-ANCA	< 10 EU
BNP	244.2 pg/ml		

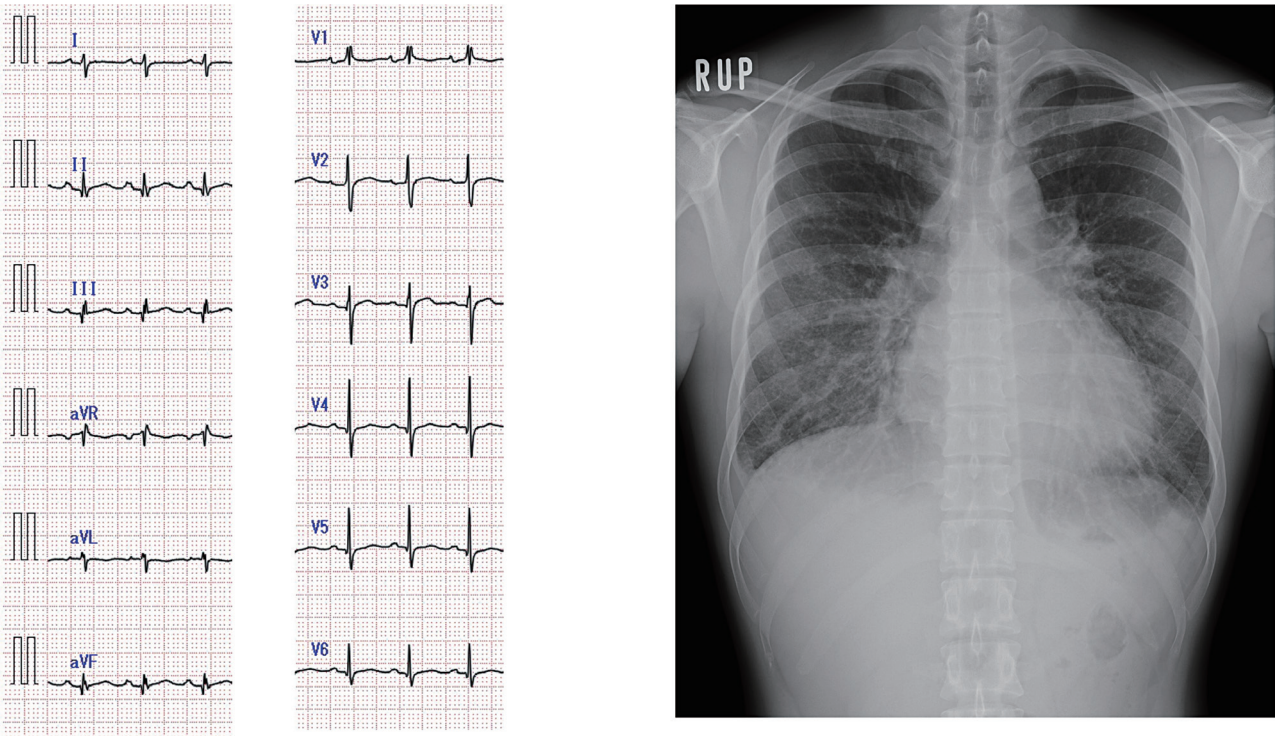

Fig. 1 Electrocardiogram(ECG) and chest roentgenogram on admission.
ECG showed slight ST depression in the V4, V5 and V6 lead. Chest roentgenogram showed cardiomegaly, congestion and infiltration.

of the left ventricle; there were mild thickening and increased echogenicity in the left ventricular wall with mild to moderate accumulation of pericardial fluid.

EM was suspected based on the presence of cardiac symptoms, such as dyspnea; the elevated eosinophil count and levels of cardiac enzymes; and the echocardiography results. Cardiac catheterization was performed. There were no abnormal coronary angiography findings, but there was a diffuse hypokinetic in wall motion on left ventriculography and the left ventricular ejection fraction was 35%. Endomyocardial biopsy was performed from the right interventricular septum. During cardiac catheterization, blood pressure decreased to 70/40 mmHg and an IABP was inserted. The patient was then transferred to the intensive care unit. Due to the presence of concomitant cardiogenic shock, IABP and administration of a cardiotonic agent and a vasodilator were started; corticosteroids were administered without waiting for the results of the endomyocardial biopsy. Methylprednisolone was administered at a dose of 1,000 mg/day for 3 days, followed by prednisone administration at 50 mg/day. The results of the endomyocardial biopsy showed marked eosinophil infiltration with severe myocardial interstitial edema; necrosis and fibrosis were seen in some myocardial cells (Fig. 3).

Seven days after the start of corticosteroid therapy, the IABP, cardiotonic agent, and vasodilators were discontinued and the patient was discharged from the intensive care unit. After 10 days, the peripheral blood eosinophil count normalized to 190/L. Echocardiography showed improvement in the left

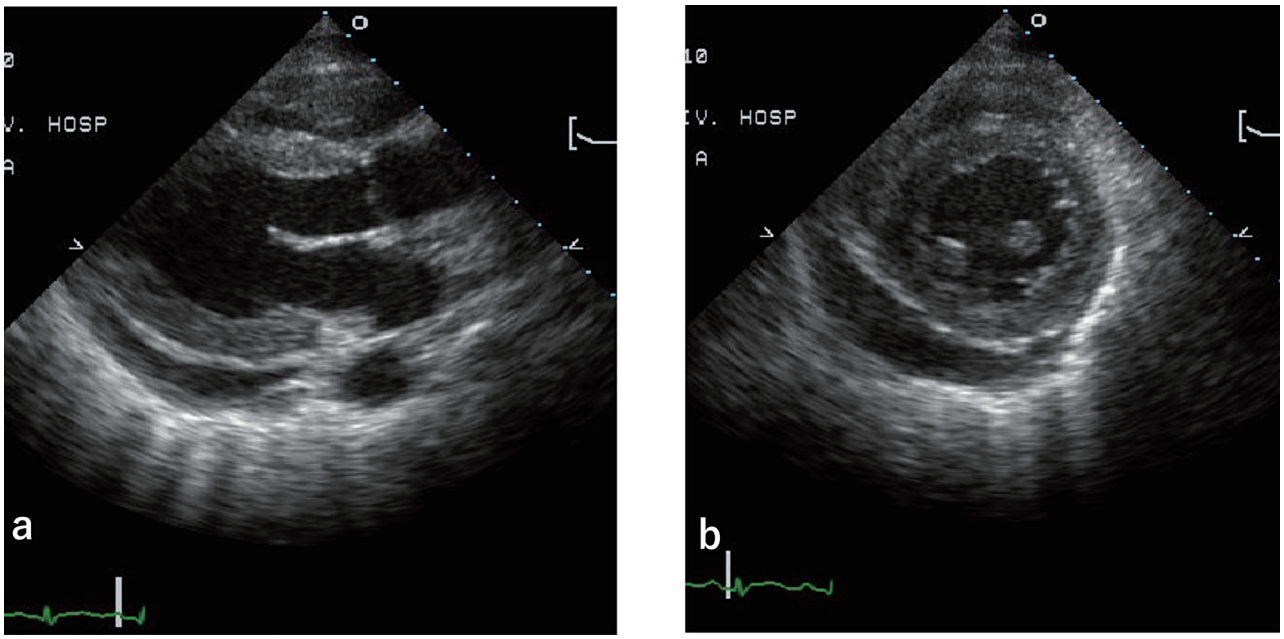

Fig. 2 Routine echocardiography on admission. Parasternal (a) and short axis (b)
Echocardiography showed hypokinesis and mild hypertrophy of the left ventricle wall, and moderate pericardial effusion.

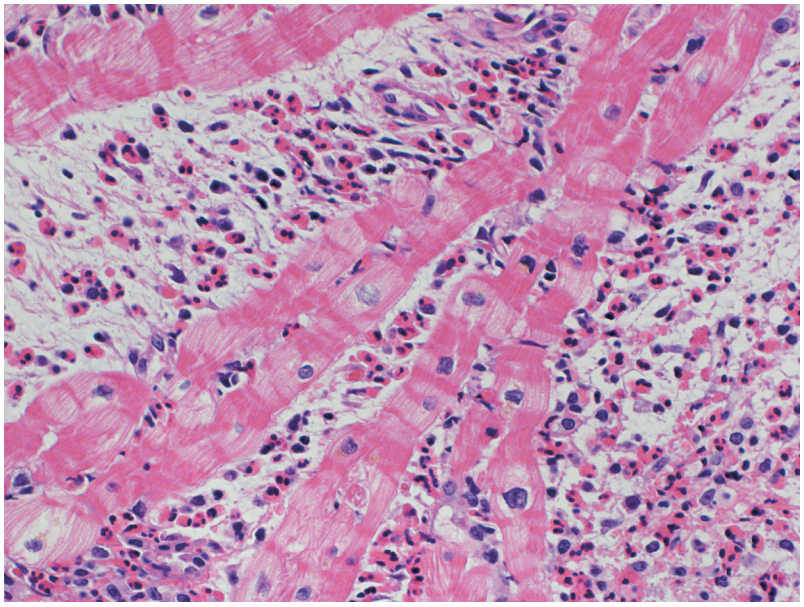

Fig. 3 An endomyocardial biopsy specimen showed remarkable eosinophilic cell infiltration at the interstitial of the myocardium. (Hematoxylin and Eosin staining, x200).

ventricular contractility and normalization of the previously thickened left ventricular wall. Although the prednisone dose was tapered, no increase in peripheral blood eosinophil count or worsening of left ventricular contractility was seen. Subsequently, the patient was discharged 33 days after the onset of symptoms.

DISCUSSION

Fauci *et al*. defined idiopathic hypereosinophilic syndrome (HES) as a condition in which idiopathic peripheral blood eosinophilia of ≥1,500 cells/L, persists for 6 months or longer and results in damage to various organs [5]. Although the skin, lungs, gastrointestinal tract, heart, and nerves are the organs that can be affected, EM is the main cause of death in patients with HES [6]. Although the definitive diagnosis of EM is based on endomyocardial biopsy, the following 5 changes should lead to a strong suspicion of EM: (1) an increased peripheral blood eosinophil count (≥ 500 cells/L); (2) cardiac symptoms, such as chest pain, dyspnea, and palpitations; (3) elevation of cardiac enzymes, such as creatine kinase MB (CK-MB) and myocardial troponin T; (4) electrocardiogram changes; and (5) transient left ventricular wall thickening or abnormal wall motion seen on echocardiography [7]. As in the case of viral myocarditis, flu-like symptoms such as fever, sore throat, and cough are seen in two-thirds of patients [3, 4].

Although the blood findings in EM include an increase in eosinophils, as in our case, patients without blood eosinophilia are also seen [8]. In some patients, the eosinophil count is normal in the early stage of cardiac failure, but gradually increases subsequently [9]. Therefore, increase in eosinophil count should always be a focus of attention in myocarditis. Moreover, it has been reported that the eosinophil count is not necessarily concordant with the severity of cardiomyopathy [7]. The commonly seen electrocardiogram changes are ST-T segment changes and abnormal Q waves. Atrioventricular block, which is frequently seen in viral myocarditis, is rare in EM [3]. Transient left ventricular thickening and abnormal left ventricular wall motion are seen on echocardiography [10]. The increase in wall thickness results from myocardial interstitial edema and typically improves in 7 to 14 days [11]. In our case, left ventricular wall thickening and focal decrease in wall motion were seen in the acute phase. However, improvement was seen on echocardiography at 10 days after the start of corticosteroid therapy and the onset of symptoms. These findings indicated that the interstitial edema, which was caused by eosinophil infiltration, decreased as a result of the corticosteroid therapy [11].

The definitive diagnosis of EM is based on endomyocardial biopsy. Pathology findings for EM show an acute necrotic phase, in which lymphocytes and eosinophils infiltrate the myocardium; an intermediate phase, which is characterized by thrombus formation in the damaged endocardium; and a fibrotic phase, which occurs due to remodeling caused by inflammation [12, 13]. Although clinical symptoms are not seen in the initial acute necrotic phase, cardiac failure symptoms are thought to first occur from the intermediate phase to the fibrotic phase [12, 13]. When the fibrosis becomes pronounced, the decrease in cardiac function becomes irreversible. In our case, eosinophil infiltration associated with myocardial interstitial edema and focal fibrosis were seen, and the disease was thought be at the intermediate to the fibrotic stages.

Corticosteroids are generally effective for the treatment of EM and have frequently been reported to reduce the eosinophil count and improve cardiac symptoms. Other treatments that have been reported to be effective are hydroxyurea, interferon alpha, cyclosporine, imatinib, and anti-IL-5 antibody therapy [14]. There have also been reports on cases of spontaneous resolution of EM [3], and some question remains about the need for drug therapy in all patients. However, early intervention, such as corticosteroid therapy, is necessary for cases with associated cardiac symptoms or shock, such as in the present case [15, 16].

In this report, we described a case of EM associated with cardiogenic shock in which remission resulted from early corticosteroid therapy.

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