【 CASE REPORT 】

# A Rare Case of Löffler "Pancarditis" Associated with Hypereosinophilic Syndrome

Makoto Yoshiji [1], Kensuke Matsumoto [1], Hiroshi Fujita [1], Keisuke Miwa [1], Hidekazu Tanaka [1], Masato Komatsu [2] and Ken-ichi Hirata [1]

**Abstract:**

A 53-year-old woman was admitted to another hospital because of a 2-month history of repeated chest pain and breathlessness. Laboratory examinations demonstrated the presence of hypereosinophilia (absolute count of 6,500/μL). An endomyocardial biopsy confirmed eosinophilic infiltration with myocardial destruction. On cardiac magnetic resonance imaging, late gadolinium enhancement was clearly observed along the visceral pericardium as well as on the endocardial layer. Based on the multimodal imaging and histopathological findings, the final diagnosis of "Löffler pancarditis" was made. After the introduction of steroid therapy, the left ventricular contractile function significantly recovered. Furthermore, the late gadolinium enhancement of the visceral pericardium had attenuated.

**Key words:** Löffler endocarditis, hypereosinophilic syndrome, pericarditis, case report

## Introduction

Hypereosinophilic syndrome (HES) is a heterogeneous group of disorders characterized by idiopathic peripheral blood and bone marrow eosinophilia, infiltration of multiple tissues by eosinophils, and multiorgan dysfunction (1). Although any organs can be involved in this disorder, including the sinuses, lungs, skin, heart, peripheral nerves, and other structures, 40-50% of patients with HES are known to develop cardiac involvement (2), which is the most common cause of morbidity and mortality (3).

Pathologically, the main focus of cardiac involvement is the endocardium and myocardium, leading to endocardial fibrosis, myocardial eosinophilic inflammation, and mural thrombus formation (4). Thus, these pathological conditions have been conventionally referred to as Löffler "endomyocarditis."

We herein report an extremely rare case of eosinophilic pericarditis on a background of Löffler endomyocarditis associated with HES, that we refer to as Löffler "pancarditis."

## Case Report

A 53-year-old woman was admitted to another hospital because of a 2-month history of repeated chest pain and breathlessness. Electrocardiography revealed a sinus rhythm with poor R wave progression in the precordial leads along with T wave inversion in leads II, III, $aV_F$, and $V_1$ to $V_6$ (Fig. 1a). The patient underwent urgent coronary angiography, which did not show any significant coronary artery stenosis. Laboratory findings demonstrated an increased brain natriuretic peptide (BNP) level of 285 pg/mL and elevated Troponin I level of 2.38 ng/mL (normal range <0.029 pg/mL), indicating ongoing myocardial damage. Notably, the absolute eosinophil count was a maximum of 6,500/μL. Because acute eosinophilic myocarditis was suspected, she underwent an endomyocardial biopsy at that time. She was then referred to our institution for a further investigation and treatment.

Her medical history included atopic dermatitis, chronic sinusitis, and bronchial asthma from childhood, which suggested the presence of allergic diathesis. She was not pre-

**(a) Initial presentation**
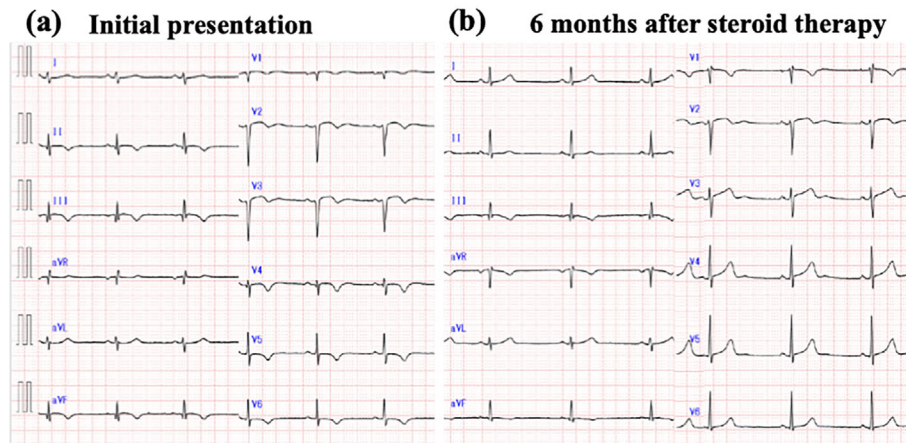
**(b) 6 months after steroid therapy**



**Figure 1.** (a) An electrocardiogram on admission shows poor R wave progression in the precordial leads along with T wave inversion in leads II, III, $aV_F$, and $V_1$ to $V_6$. (b) An electrocardiogram six months after steroid therapy shows an increased R wave amplitude in the precordial leads concomitant with the normalization of T wave.
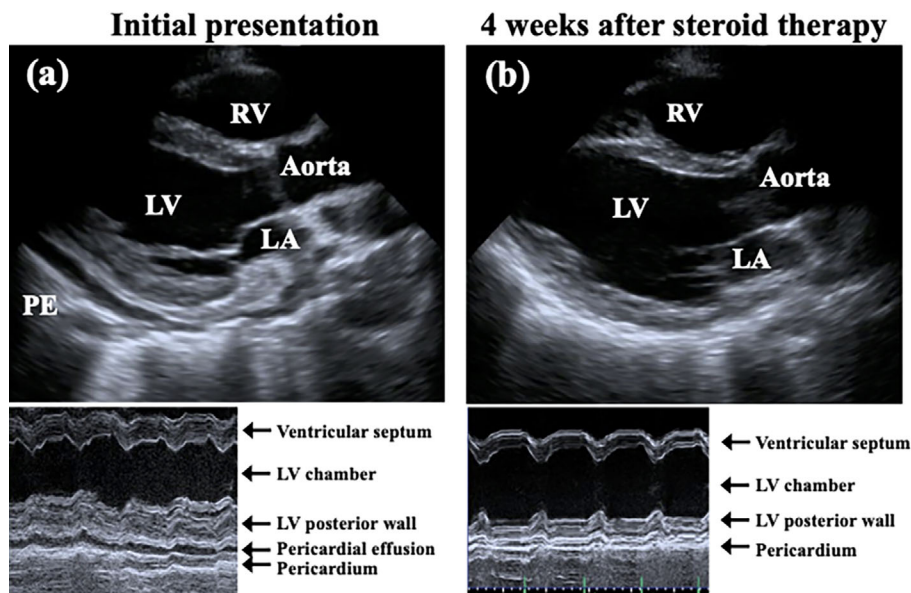
**Initial presentation**

**4 weeks after steroid therapy**



**Figure 2.** (a) B-mode and M-mode echocardiograms are shown. Transthoracic echocardiography revealed diffuse edematous thickening of the left ventricular (LV) myocardium concomitant with a moderate amount of pericardial effusion. (b) At four weeks after steroid therapy, the LV myocardial thickening and pericardial effusion had disappeared. LV: left ventricle, RV: right ventricle, LA: left atrium, PE: pericardial effusion

scribed any drugs other than inhaled salmeterol/fluticasone. On referral to our institution, her blood pressure was 100/50 mmHg, heart rate 68 bpm, and oxygen saturation 97% (room air). Auscultation revealed a Levine I/VI systolic regurgitant murmur at the apex. There were no other notable findings, including exanthema or rash, associated with hypereosinophilia. Chest computed tomography revealed ground-glass opacification in the middle lobe of the right lung field, which indicated the eosinophilic infiltration. A histological examination of the nasal polyps and duodenal mucosa revealed eosinophilic infiltration without findings suggestive of vasculitis or granulomas. A bone marrow sample showed hyperplasia of eosinophilic granulocytes, which accounted for as many as 30% of all nucleated cells, without findings of myeloproliferative neoplasms. Despite a thorough etiological investigation, the underlying cause of hypereosinophilia remained unclear. Because a diagnosis of eosinophilic granulomatosis with polyangiitis was excluded based on the histopathological findings, she was finally diagnosed with idiopathic HES.

Transthoracic echocardiography revealed diffuse edematous thickening of the left ventricular (LV) myocardium concomitant with moderate amounts of pericardial effusion (Supplementary material 1, 2). Furthermore, the LV contractile function was moderately impaired (LV ejection fraction of 45.9%) without ventricular dilation (Fig. 2a, Supplemen-
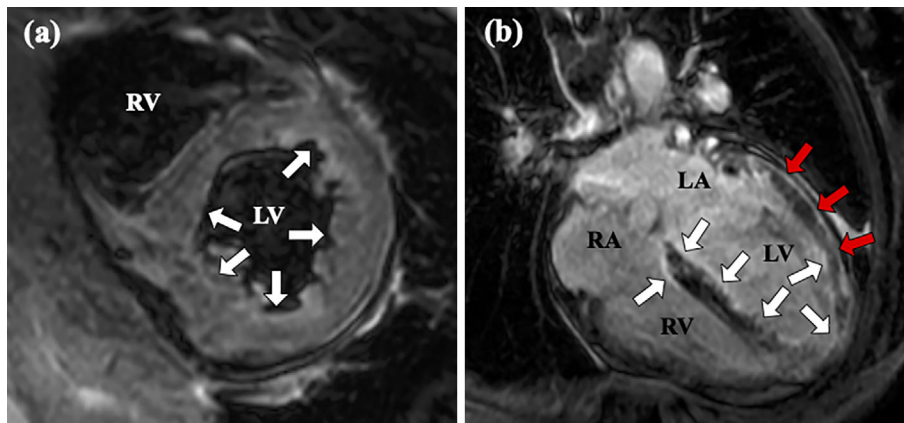
**Figure 3.** (a) T2-weighted cardiac magnetic resonance imaging shows a diffuse high-intensity signal mainly in the endocardial layer (white arrows). (b) Late gadolinium enhancement is clearly observed along the visceral pericardium (red arrows), as well as in the endocardial layer (white arrows). The fat-suppression technique was adopted for this image.
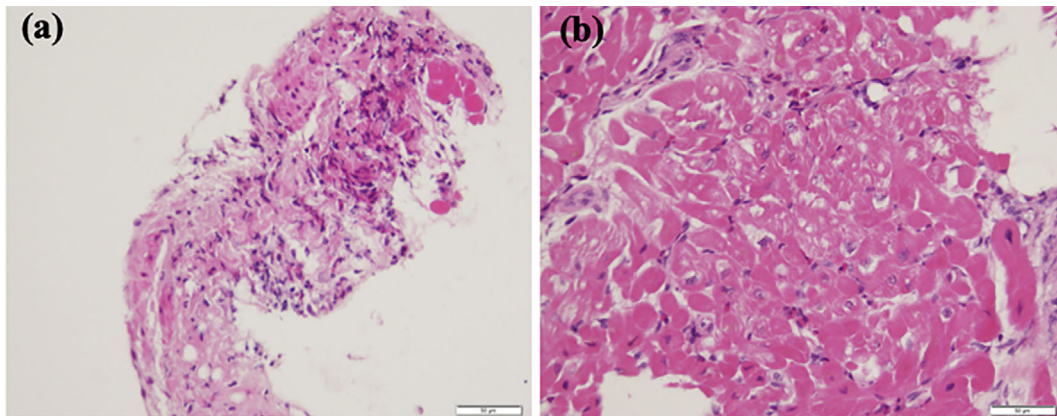


**Figure 4.** Significant infiltration of eosinophils on the endocardial surface (a) and into the myocardium (b) is shown.

tary material 3). Cardiac magnetic resonance imaging showed a diffuse high-intensity signal in the endocardial layer on T2-weighted images (Fig. 3a, white arrows), which was consistent with endomyocarditis resulting from hypereosinophilia. Notably, late gadolinium enhancement was clearly observed along the visceral pericardium (Fig. 3b, red arrows) as well as in the endocardial layer (Fig. 3b, white arrows). Thereafter, the findings of the endomyocardial biopsy confirmed eosinophilic infiltration with myocardial destruction, which was consistent with Löffler endomyocarditis (Fig. 4). Based on the multimodal imaging and histological findings, the final diagnosis of Löffler endomyocarditis complicated by pericarditis (i.e., "pan-carditis") resulting from HES was made.

The patient was prescribed 45 mg/day (1 mg/kg) of prednisolone and 2.5 mg of warfarin; her eosinophil count dramatically decreased to 370/μL three days after the initiation of prednisolone. At 4 weeks after medical treatment, transthoracic echocardiography clearly showed the resolution of the LV myocardial edematous thickening and pericardial effusion (Fig. 2b and Supplementary material 4). Furthermore, the LV contractile function also recovered to an LV

ejection fraction of 62.7% (Supplementary material 5). At four weeks after the therapy, repeated cardiac magnetic resonance imaging confirmed the attenuation of late gadolinium enhancement of the visceral pericardium (Fig. 5), suggesting the remission of the pericarditis. In parallel with the improvement of the findings of pericarditis, her chest pain also disappeared. At 6 months after steroid therapy, the Troponin I and BNP levels had significantly decreased to 0.02 ng/μL and 34.5 pg/mL, respectively. Furthermore, an increase in the R wave amplitude in the precordial leads along with the normalization of T wave was confirmed on electrocardiography (Fig. 1b). Although the prednisolone dose was reduced to 7 mg/day, the eosinophil count continued to be within the normal range, and her cardiac function remained normal.

## Discussion

Löffler endomyocarditis is known to have cardiac involvement resulting from hypereosinophilia that ultimately progresses to extensive endocardial and myocardial injury through three stages (4). In the first necrotic stage, infiltration of eosinophils and subsequent degranulation leads to
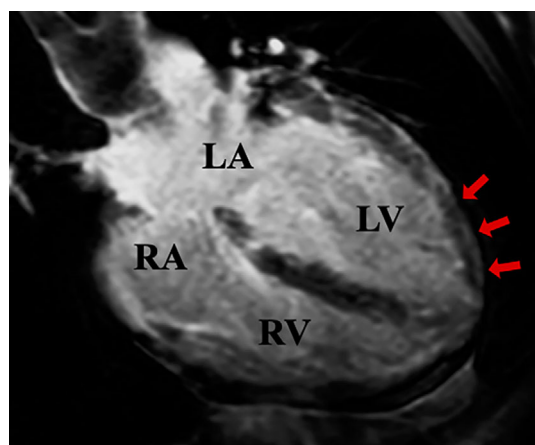
**Figure 5.** Late gadolinium enhanced cardiac magnetic resonance imaging is shown. Four weeks after steroid therapy, late gadolinium enhancement along the visceral pericardium was largely attenuated (red arrowheads).

endocardial damage, myocardial necrosis, and the formation of eosinophilic microabscesses. In the next thrombotic stage, intracardiac thrombi leads to thromboembolic strokes, ischemia of extremities, and emboli to other vital organs. In the final fibrotic stage, the damaged endocardium and myocardium are progressively replaced by the fibrous or scar tissue, which leads to endomyocardial fibrosis, inducing a restrictive physiology and ultimately heart failure.

Therefore, the primary targets for the management of the cardiac involvement of HES are as follows (2): the reduction of peripheral and tissue eosinophils, minimization of end-organ damage, and prevention of thromboembolic events. In the present case, 1 mg/kg of prednisolone was prescribed without delay based on the prompt diagnosis of Löffler syndrome during the early necrotic phase, which successfully prevented other end-organ damage. As a result, the troponin I and BNP levels significantly decreased, and the LV contractile function recovered remarkably soon after the introduction of steroid therapy. Furthermore, in our case, the prophylactic introduction of anticoagulation therapy prevented subsequent thromboembolic events without any hemorrhagic complications.

Classically, the cardiac involvement associated with HES takes the form of "endomyocarditis" due to the hematogenous infiltration of eosinophils and subsequent degranulation, mainly on the surface of the endocardium. However, there were some previous reports in which pericardial effusion was observed in Löffler endomyocarditis. Parrillo et al (5). previously reviewed the cardiovascular findings in 65 cases of HES and found that 7% of the cases developed pericardial effusion, and 15% of cases complained of chest pain. Although these findings suggest that Löffler endomyocarditis can insidiously be complicated by pericardial in-

volvement, there have been few cases with pericardial involvement that was confirmed by imaging or histological findings in this disease category (6).

In this case, repeated pericardial chest pain was the initial presentation of the cardiac involvement associated with HES, with evidence of a moderate amount of pericardial fluid. Furthermore, cardiac magnetic resonance imaging clearly demonstrated late gadolinium enhancement along the visceral pericardium, which indicates the coexistence of acute pericarditis (7, 8). Pericardial enhancement, as well as pericardial effusion, resolved following steroid therapy. To our knowledge, this is the first case of Löffler endomyocarditis complicated with pericarditis (i.e., Löffler pancarditis) that was clearly proven by combined histopathological and multimodal imaging assessments.

## Conclusion

We encountered a unique case of Löffler "pancarditis" associated with HES diagnosed using a combination of an endomyocardial biopsy and a novel imaging modality. Advances in diagnostic imaging techniques may aid in the diagnosis of Löffler "pancarditis."

**The authors state that they have no Conflict of Interest (COI).**

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