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CASE REPORT

A Case of Acute Eosinophilic Pneumonia Associated with Heated Rubber Fume Exposure

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ABSTRACT

Background: We report a rare case of acute eosinophilic pneumonia (AEP) associated with heated rubber fume exposure.

Methods: A 31-year-old Ethiopian man, working at a rubber plant, was admitted to our hospital because of refractory dyspnea and fever. Computed tomography of the chest showed bilateral interstitial shadows and pleural effusion. We suspected AEP and performed fiberoptic bronchoscopy.

Results: The eosinophil fraction was elevated at 59% in the bronchoalveolar lavage fluid (BALF). From the history of inhalation of heated rubber at the working place and hypereosinophilic counts in the BALF, he was given a diagnosis of AEP associated with heated rubber fume exposure. His symptoms and chest radiographic findings were drastically improved by corticosteroid therapy.

Conclusions: Heated rubber fume can be a causative substance for AEP. In similar situations, physicians should consider AEP and order various examinations for confirmation.

KEY WORDS

acute eosinophilic pneumonia (AEP), bronchoalveolar lavage, corticosteroids, heated rubber

INTRODUCTION

Acute eosinophilic pneumonia (AEP) is a relatively new disease concept introduced in 1989 by Allen *et al.*[1] AEP is pathologically characterized by infiltration of eosinophils into the alveolar septae. Almost all cases respond to corticosteroid therapy. Smoking or drugs have been reported as the causes of this disease, but onset associated with exposure to heated rubber fume is rare. We report a rare case of AEP associated with heated rubber fume exposure, and examined the relation between the cause and the disease on the basis of previous reports of similar cases.

CLINICAL SUMMARY

A 31-year-old Ethiopian man, working at a rubber plant, presented at a local clinic with a 2-day history of dyspnea and fever on August 21, 2001. He had no past history of allergic diseases, including asthma, or present smoking. Bilateral diffuse infiltrative shadows were revealed on a chest radiograph, and laboratory data at the local clinic demonstrated an increased WBC of 18,000/μl and CRP of 18.6 mg/dl. No eosinophilia was found at that time. Various antibiotics were administered, but the patient's condition remained refractory to treatment. On August 24, the patient was referred to our hospital for further examination and therapy.

He had been in charge for two months of pouring raw materials into moulds and heat-pressing to produce rubber products, and had occasionally inhaled heated rubber fumes. He had no respiratory symptoms at the beginning of the work, but after a change in the kind of raw material to "epoxy resin" on August 17, he gradually started having fever and dyspnea.

PATHOLOGICAL FINDINGS

On examination the patient complained of high fever and dyspnea requiring oxygen therapy. Fine crepitation was audible on the dorsal side of the bilateral lower lung fields. There were no pretibial edema or

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Table 1 Laboratory data on admission to our hospital

Peripheral Blood		Biochemistry		Serology	
WBC	7900 /μl	TP	6.4 g/dl	CRP	10.0 mg/dl
(neut 54.4, lym 19.2, mo 8.1,		Alb	3.3 g/dl	ESR	117 mm/hr
eosino 18.2, baso 2.0%)		Na	141 mEq/l	RF	<12 IU/ml
RBC	389×10^4 /μl	K	4.5 mEq/l	IgG	1080 mg/dl
Hb	12.8 g/dl	Cl	105 mEq/l	IgA	268 mg/dl
Hct	37.1 %	Ca	8.7 mg/dl	IgM	86 mg/dl
Plt	17.9×10^4 /μl	Cr	0.7 mg/dl	IgE	6117.8 U/l
		BUN	10 mg/dl	KL-6	468 U/ml
		AST	48 IU/l	SP-D	253.5 ng/ml
		ALT	47 IU/l	β-D-glucan	12.20 pg/ml
		LDH	252 IU/l	Anti-Chlamydia Ab	(-)
		Al-P	189 IU/l	Anti-Mycoplasma Ab	(-)
		γGTP	11 U/l	Anti-Legionella Ab	(-)
				ANA	(-)
				P-ANCA	(-)
				C-ANCA	(-)

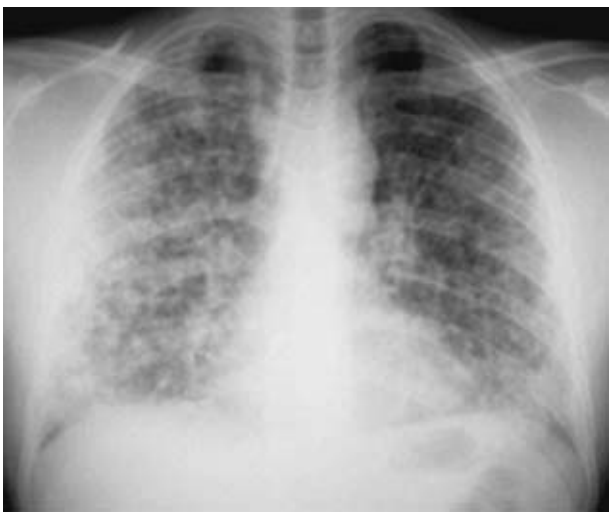

Fig. 1-A Chest radiogram on admission (August 21, 2001) showing bilateral interstitial shadows and pleural effusion.

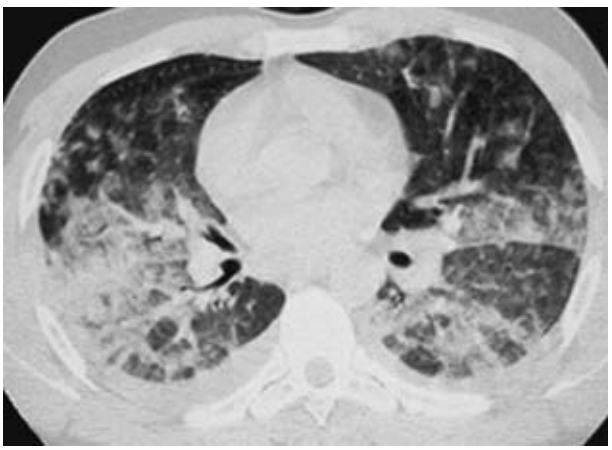

Fig. 1-B Chest CT scan on admission (August 21, 2001) showing bilateral ground-glass opacities and pleural effusion.

jugular vein dilatation suggesting congestive heart failure. Laboratory test results on admission to our hospital (Table 1) showed a WBC of 7900/μl, and elevated eosinophil count of 18.2%. Serum IgE was elevated at 6117.8 IU/ml, also suggesting some allergic reaction. PaO_2 was 64 torr with oxygen by nasal cannula at 4 l/min. Biochemical tests showed no abnormality, but the erythrocyte sedimentation rate was elevated at 117 mm/h and CRP was 10.0 mg/dl. Autoantibodies, such as the antinuclear antibody, rheumatoid factor, and antineutrophil cytoplasmic antibody (ANCA), were negative. Sputum examination showed no bacteria or fungi. Furthermore, the patient was negative for Chlamydia, Mycoplasma, Legionella, and HIV antibodies. No lung function test was performed because of severe dyspnea.

Chest radiograms taken on August 21, 2001 (Fig. 1-A) revealed bilateral diffuse infiltrative shadows and pleural effusion. Chest computed tomography (CT ; Fig. 1-B) also showed ground glass opacity in the bilateral lower lung fields and pleural effusion.

On the day of admission, emergency fiberoptic bronchoscopy was performed. In the bronchoalveolar lavage fluid (BALF), the total cell count was 2.7×10^5 /ml, and the eosinophil fraction was elevated at 59%. The neutrophil, lymphocyte, and macrophage fractions were 6, 20 and 15%, respectively (Table 2). In addition, the BALF revealed no evidence of bacteria, fungi or acid-fast bacillus infections. Oral administration of prednisolone (50 mg/day) was initiated based

Table 2 Bronchoalveolar lavage fluid showed increased total cell counts and eosinophil fraction

Bronchoalveolar lavage fluid		
Total cell counts	2.7×10^6/ml	
Cell differentiation	Neutrophil	6%
	Eosinophil	59%
	Lymphpcyte	20%
	Macrophage	15%
Bacterial Culture	negative	

on the diagnosis of AEP on August 24, and the subjective symptoms and chest radiographic findings were drastically improved on August 27 (Fig. 2). Prednisolone was tapered every 10 mg, and the WBC and CRP were improved to 8700/μl (eosinophil : 2.9%) and 0.2 mg/dl, respectively, on August 30. Although he returned to the working place after discharge from our hospital, he had no recurrence of AEP without prednisolone.

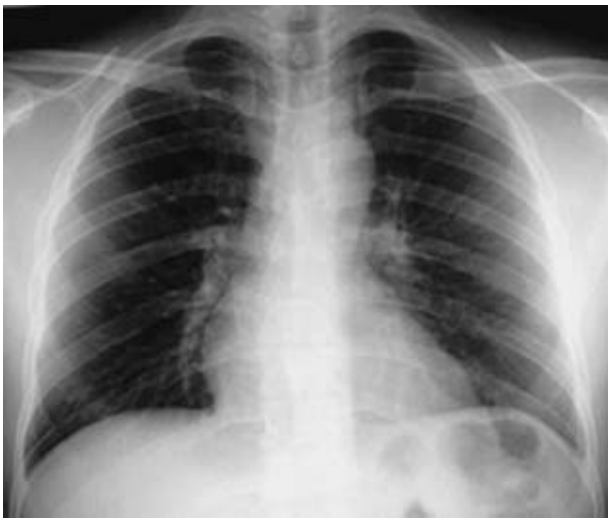

Fig. 2 Chest radiogram taken after treatment (August 27, 2001) showing no abnormal findings.

DISCUSSION

AEP is a relatively new disease concept introduced by Allen *et al.*[1] and Badesch *et al.*,[2] and its diagnostic criteria have been established as follows : acute progression, hypoxemic respiratory failure, diffuse alveolar or alveolar-interstitial infiltrative shadow, eosinophilia above 25% in the BALF, absence of infection, absence of atopic disease, rapid response to corticosteroid therapy, and failure to relapse after discontinuation of corticosteroids.[3] In previous cases of AEP, the following causes have been documented : smoking,[4] drugs,[5] and so forth. However, there have been no reports of AEP associated with heated rubber fume exposure.

There have been several reports of eosinophilia in rubber plant workers or associated with epoxy resin. Bascom *et al.*[6] reported five patients with eosinophilia, respiratory symptoms, and chest X-ray infiltrative shadows, and some workers experienced recurrence of symptoms upon return to work. Since bronchoalveolar lavage was not performed in these cases, it is not known whether they had AEP or not. Thomas *et al.*[7] conducted a case-control study on rubber press operators with respiratory symptoms, and documented eosinophilia in more than 40% of symptomatic patients and in 21 of 25 thermoinjection process operators. Aleva *et al.* reported occupational asthma caused by epoxy resin.[8] It is noteworthy that heated rubber or epoxy resin had been shown to induce peripheral eosinophilia and eosinophilic lung disease before the concept of AEP was proposed.

The mechanism of AEP remains unclear. Since the levels of interleukin-5 and granulocyte macrophage-colony stimulating factor (GM-CSF) are elevated in the peripheral blood and BALF of AEP patients, and GM-CSF induces AEP in experimental models,[9] the causative substance is believed to activate cytokines that induce eosinophilia. Our report suggests that aliphatic or cycloaliphatic compounds, such as epoxy or rubber, may be causative to eosinophilic lung disease, including AEP.

When treating patients with a similar background, course and symptoms to the case of acute eosinophilic pneumonia associated with heated rubber fume exposure reported here, physicians should consider AEP due to heated rubber fume inhalation, and order various examinations, including bronchoalveolar lavage, to aid in the differential diagnosis.

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