

Bronchial Asthma Induced by Rice

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A 43-year-old patient with rice-induced bronchial asthma was first admitted to our hospital for developing bronchial asthma induced by mite and house dust. At that time, there was no sign of allergic response to rice. Two years later, he was readmitted in an emergency state, with a severe attack of bronchial asthma. This time, however, the result of immunoglobulin E (IgE)-radioallergosorbent test (RAST) for rice was positive, with those to mite and house dust were unexpectedly negative. The causative factors and pathological mechanisms of various kinds of food allergies still remain unknown. The patient is now followed up in an ambulatory setting, and has been eating hypoallergenic rice with no bronchial asthma-induced attack. The present case, being an adult patient with severe grain-induced bronchial asthma previously allergic to mite and house dust, seems to be rather rare in the literature.

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Key words: allergy, adult, hypoallergenic rice, grain

Introduction

In Japan, the major allergens are considered to be egg, milk and soybean. Recently, attention has also been given to rice, wheat and buckwheat. Bronchial asthma induced by grains, however, is still rare. We herein report a case of rice-induced bronchial asthma.

For editorial comment, see p 5.

Case Report

A 43-year-old male patient was first admitted to our hospital in January 1994 for developing bronchial asthma induced by mite and house dust. At that time, there was no sign of allergic response to rice (Table 1). Based on allergy testing he was diagnosed as having mite and house dust-induced bronchial asthma. Following discharge, infusions of bronchodilators and steroids were occasionally given for minimal distress. Also, he moved to another house hoping that would decrease his exposure to allergens. However, in February 1996, the patient again had frequent asthma attacks and was admitted emergently to our department. On admission, he was still slightly unconscious (Japan Coma Scale; 1–1). Respiration rate was 14/min,

auscultation of chest revealed weak piping rales. Pulse rate was 140/min. Arterial blood gas analysis revealed alkalosis, pH 7.5, P_{O_2} 45.8 mmHg, and P_{CO_2} 29.3 mmHg (Table 1). Methylprednisolone 750 mg and aminophylline were administered. He was alert and blood gas was markedly improved the following day (Fig. 1). Allergy tests to elucidate the cause of his attack revealed an elevated immunoglobulin E (IgE) score of 2,970 U/l, IgE-radioallergosorbent test (RAST) for rice of 102.4 UA/ml and IgE-multiple antigen simultaneous test (MAST) scores for rice of 32.6 IOOLC (Table 2).

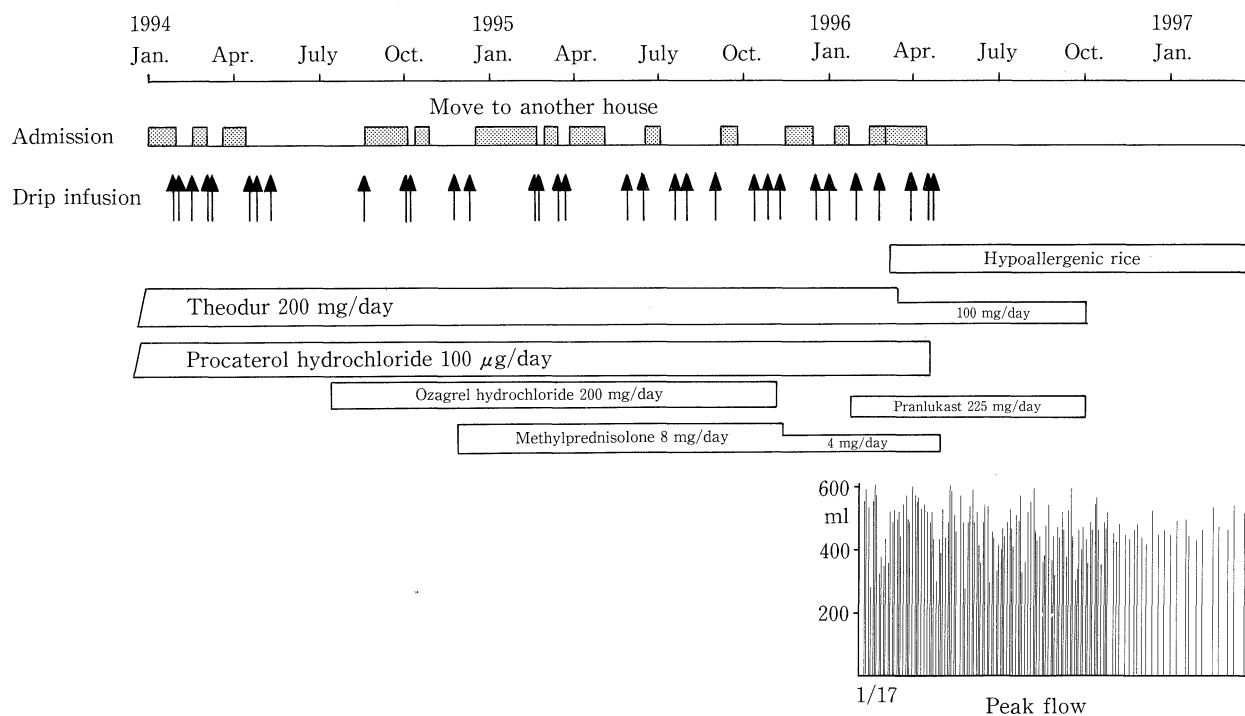
Clinical course

During the hospital stay, the asthma was cleared by the administration of steroid and theophylline. In order to clarify the allergen, daily intake of rice was discontinued for 3 weeks, because IgE RAST for rice was positive. As a result of the rice-free diet, the peak flow level was significantly improved. A challenge test was carried out under the suspicion of rice as the allergen. The test-diet was started with 30 g/day of rice which was gradually increased to 300 g/day, at which point, wheezing became noticeable. The peak flow level was lowered. Diet with hypoallergenic rice was also tested in the same way, and the results for allergen were negative. Therefore, the patient now eats hypoallergenic rice. Although oral administration of medicines was discontinued, the patient has had no attacks of

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Table 1. Allergy-related Testing (Jan. 18, 1994)

IgE RAST (Rice)	32.8 UA/ml		
IgE MAST			
Inhalation	Alimentary		
House dust (+3)	House dust (+3)		
<i>Dermatophagoides farinae</i> (+)	<i>Dermatophagoides farinae</i> (+)		
Egg white (-)	Japanese cedar (-)		
Soybean (-)	Cat dander (-)		
Ragweed mixture (-)	Egg white (-)		
Mugwort (-)	Milk (-)		
Timothy grass (-)	Cheddar cheese (-)		
Sweet vernal grass (-)	Beef (-)		
Japanese cedar (-)	Chicken meat (-)	(-):	negative
<i>Penicillium notatum</i> (-)	Shrimp (-)	(±):	1.01~4.40 100LC
<i>Cladosporium herbarum</i> (-)	Crab (-)	(+):	4.41~11.2 100LC
<i>Candida albicans</i> (-)	Tuna (-)	(+2):	11.3~20.0 100LC
<i>Alternaria alternata</i> (-)	Salmon (-)	(+3):	20.0~ 100LC
<i>Aspergillus fumigatus</i> (-)	Cultivated wheat pollen (-)		
Cat dander (-)	Rice (-)		
Dog epithelium (-)	Soybean (-)		

**Figure 1. Clinical course.**

bronchial asthma. During the clinical course, tests by oral administration with aspirin were carried out. However, neither eruptions nor wheezing occurred, which suggests that there is no complication of aspirin-induced asthma (AIA). Furthermore, the patient presented no dermatological disorders such as atopic dermatitis despite eating rice. The digestive organs were

also undisturbed, the endoscopic findings of the stomach were normal. Serum IgE-MAST score of 32 types of allergens, either oral or inhalant type, were determined. In the results, rice scored +3, cultivated wheat pollen was +2, and soybean scored ±. The result of subcutaneous tests for 38 allergens such as candida and house dust were all negative. The results of inhalant inducing

Table 2. Laboratory Findings

Blood Cell Counts		Blood Chemistry		Blood Gas Analysis (room air)	
White blood cell	6,800/ μ l	Total protein	6.4 g/dl	pH	7.531
Stab	5%	Albumin	51.5%	Partial pressure of carbon dioxide	29.3 Torr
Segmental neutrocyte	38%	α_1 -gl	5.0%	Partial pressure of oxygen	45.8 Torr
Eosinophil	15%	α_2 -gl	16.4%	BE	+1.3 mmol/l
Basophil	5%	β -gl	8.0%	Saturation of oxygen	88.5%
Lymphocyte	33%	γ -gl	19.1%	Immunoglobulin (Ig)E	2,970 U/ml
Monocyte	4%	Aspartate aminotransferase	13 IU/l	IgG	1,190 mg/dl
Red blood cell	39×10^4 / μ l	Alanine aminotransferase	20 IU/l	IgA	234 mg/dl
Hemoglobin	14.1 g/dl	Lactate dehydrogenase	329 IU/l	IgM	176 mg/dl
Hematocrit	41.0%	γ -glutamyltranspeptidase	10.4 IU/l		
Platelet	26.8×10^4 / μ l	Alkaline phosphatase	114 IU/l		
Erythrocyte sedimentation rate	34 mm/h	Choline esterase	0.5 Δ pH		
C-reactive protein	1.3 mg/dl	Total bilirubin	0.1 mg/dl		
		Total cholesterol	115 mg/dl		
		Glucose	128 mg/dl		
		Blood urea nitrogen	10.2 mg/dl		
		Creatinine	0.7 mg/dl		
		UA	3.6 mg/dl		
		Na	135 mEq/l		
		K	3.6 mEq/l		
		Cl	97 mEq/l		

Table 3. Allergy-related Testing (Feb. 4, 1996)

IgE RAST (Rice)		102.4 UA/ml
IgE MAST		
Inhalation	Alimentary	
House dust (-)	House dust (-)	
<i>Dermatophagoides farinae</i> (-)	<i>Dermatophagoides farinae</i> (-)	
Egg white (-)	Japanese cedar (-)	
Soybean ($\pm$, 1)	Cat dander (-)	
Ragweed mixture (-)	Egg white (-)	
Mugwort (-)	Milk (-)	
Timothy grass (-)	Cheddar cheese (-)	
Sweet vernal grass (-)	Beef (-)	
Japanese cedar (-)	Chicken meat (-)	(-): negative
<i>Penicillium notatum</i> (-)	Shrimp (-)	($\pm$): 1.01~4.40 100LC
<i>Cladosporium herbarum</i> (-)	Crab (-)	(+): 4.41~11.2 100LC
<i>Candida albicans</i> (-)	Tuna (-)	(+2): 11.3~20.0 100LC
<i>Alternaria alternata</i> (-)	Salmon (-)	(+3): 20.0~ 100LC
<i>Aspergillus fumigatus</i> (-)	Cultivated wheat pollen (+, 2)	
Cat dander (-)	Rice (+3, 32.6 100LC)	
Dog epithelium (-)	Soybean ($\pm$, 1)	

tests using allergen extracts for subcutaneous responses were also negative. The patient has been followed up with all oral administrations, and he eats hypoallergenic rice as a staple food. No attacks discontinued of bronchial asthma have occurred to date an IgE level of 240 U/ml, and a IgE RAST score of 0.34 UA/ml for rice.

Discussion

Hypersensitivities to foods and/or their additives are widely regarded as allergies. However, the mechanisms behind such reactions are complicated (1). Allergies caused by foods are classified by the American Academy of Allergy and Immunol-

ogy Committee. Although it has been considered that the mechanisms of various food allergies are related to other kinds of allergies such as types I, III, IV, they still have not been sufficiently elucidated. Allergenic foods vary markedly in different areas and/or human races in accordance with their food habits (2–4). In Japan, the major allergens are considered to be egg, milk and soybean. Recently, attention has also been given to rice, wheat and buckwheat (5). Although the number of cases with positive results of IgE-RAST for grains, and those with various grain-induced dermatological disease has increased, cases with asthma induced by grain are not common. The incidence of asthma due to buckwheat is about 1.6%, while rice-induced allergy is extremely rare. This is thought to be, because rice has been the staple food for Japanese people for such a long time, that desensitization may have occurred. Moreover, rice contains a very small amount of globulin (the main allergen of rice has been presumed to be 16KDa protein, molecular weight, 16,500) (6, 7). On the first admission 2 years previously, the patient was found to be allergic to mite and house dust but not to rice. However, the result of IgE-RAST suddenly became positive for rice but not for mite nor house dust. The frequency of the asthma attacks did not diminish even after moving to a different house. Although this patient has left many unanswered questions regarding the cause of the asthma attacks, we surmise that rice-induced allergy in the present case is related to globulin. The attack of bronchial asthma, accompanied by slight dyspnea and wheezing after eating rice, did not occur when bread was substituted for rice. At present, the patient has become asymptomatic by eating hypoallergenic rice (16KDa protein free) (8, 9) as his staple food. In many cases, allergies induced by grains develop symptoms either in the digestive organs or in the skin or in both. On the other hand, development of respiratory symptoms such as coughing and wheezing are rare in such cases. The incidence of food-induced bronchial asthma in adult cases is reported to be much lower than that in children. Therefore, we consider that rice-induced

bronchial asthma in an adult is extremely rare. Furthermore, the patient presented allergy to mite and house dust on the first admission to the hospital; two years before the onset of a severe attack of bronchial asthma. Allergic tests on the second admission, however, showed that the patient was negative for mite and house dust but strongly positive for rice. It was, then, revealed that the attack was caused by rice-induced bronchial asthma. Although the present case may well be very rare in the literature, the mechanism of the sudden change of allergens should be clarified by further studies (10, 11).

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