Atopic Dermatitis: a Case Report of a 3-year-old Food Allergy Child Sensitive to Multiple Allergens

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Case report

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Abstract

Background: It was estimated that about 10% of the population suffer from food allergy. Atopic dermatitis is often associated with food allergy. In this case report, we presented a child with atopic dermatitis who was sensitive to multiple food and inhaled allergens.

Case report: A 3-year-old boy was admitted to the First Affiliated Hospital of Guangzhou Medical University due to skin allergy caused by drinking semi-hydrolyzed infant formula milk powder. Allergen test results showed that the boy was sensitive to multiple food and inhaled allergens. we conducted the follow-up interview by phone to completed the questionnaire.

Conclusion: Atopic dermatitis children with multiple food allergies must pay attention to diet adjustment to prevent or delay the development of the disease.

Background

Food allergy is an increasing global public health problem, especially among children, which is the most common cause of allergic reactions and anaphylaxis related deaths in children and adolescents [1]. Atopic dermatitis is a common inflammatory skin disease characterized by recurrent eczema and severe pruritus. According to statistics, up to 20% of children suffer from atopic dermatitis[2]. Studies had found that the occurrence and severity of atopic dermatitis are positively correlated with the risk of food allergy [3]. In this case report, we presented a child with atopic dermatitis who was sensitive to multiple food and inhaled allergens.

Methods

We reviewed the patient's previous medical records and related test results. The parent agreed to display the clinical data and related images of the boy and his brother.

Case Presentation

Living in Guangzhou, Guangdong, China, a 3-year-old boy, who was born in August, developed infant eczema a few days after birth. He was fed infant formula milk powder at about 3 months old. Many a time the boy had symptom of dermatitis after feeding formula milk powder about 7–8 hours. It mainly manifested as not only extreme itching of facial, neck and limb joints but also itching around the eyes and occasionally tearing so that the infant scratched, which resulted in skin bleeding and peeling. He was sent to the local children's hospital for treatment and diagnosed as atopic dermatitis. After 3 months old, the boy consumed deeply hydrolyzed infant formula milk powder, and the dermatitis symptoms had been moderately controlled. When the boy was 1 year and 6 months old, 21 allergens were tested in the local children's hospital. The test results showed that the level of total IgE(TIgE) ,pork, D. pteronyssinus, egg white, peanut, grass mixture, cow's milk, white oak and shrimp specific IgE(sIgE) were positive.(Table 1.)

A few months ago, atopic dermatitis symptoms worsened after feeding semi-hydrolyzed infant formula milk powder (Fig. 1). So he was sent to the First Affiliated Hospital of Guangzhou Medical University and was diagnosed as atopic dermatitis. TlgE and slgE levels of the boy were shown in Table 2. Multiple food and inhaled allergens slgE were positive and in high level, such as cow's milk, beef, pork, mutton, Crab, Shrimp, *D. pteronyssinus*, *D. farina* and Cockroach. We found that casein was the main allergenic components of cow's milk allergy of the boy respectively.

In addition to cow's milk, the boy had allergic reactions to many foods in daily life. After eating red meat and deep-sea fish such as flounder, the child felt extreme itching on his facial, scalp and periorcular (Fig. 2). After eating egg yolk, he constipated and defecate like chestnut of the next day. Eating lotus root, spinach, carrot also had constipation. In terms of drug therapy, hormone therapy was used immediately in severe cases and tacrolimus was used in mild cases, which can relieve symptoms.

The infant's father and grandfather occasionally have seasonal dermatitis, which is severe in winter with itchy and dry skin. The boy has a 13-year-old brother, who often suffered from bronchitis or pneumonia before the age of 3. Food and inhaled slgE were detected at his age of 7, the results suggesting that house dust, *D. pteronyssinus* and *D. farina* slgE were positive while food slgE was negative (Table 3). He was clinically diagnosed as allergic rhinitis, and received desensitization treatment until now. A few months ago, he went to bed after eating oysters for dinner, and then with severe itching without eczema or urticaria. The skin allergy condition of the boy's elder brother was shown in **Fig. 3**.

Finally, we recommend that the boy continue to drink amino acid infant formula milk powder and avoid consuming sensitized foods until being in a stable condition. It was suggested that the elder brother of the boy should be banned eating the allergenic food and have a comprehensive allergen examination.

Table 1
21 allergen test results of the boy in 1 year and 6 months old

Item	IgE(IU/ml)
Total IgE	> 100*
D. farina	0.40
Soybean	0.09
Peanut	0.85*
Wheat	0.17
Chicken	0.08
Pork	7.32*
Shrimp	0.36*
Cow's milk	0.56*
Egg white	3.72*
Mugwort	0.22
Cat dander	0.04
D. pteronyssinus	6.99*
Cockroach	0.08
Birch	0.11
White oak	0.37*
Short ragweed	0.10
Alternaria	0.07
Grass mixture	0.65
Humulus scandens	0.08
Dog dander	0.05
*The result is positive.(Test results of the boy in the local children's hospital)	

Table 2

TlgE and slgE levels of the boy in 3 years old

Item	IgE(kU/L)	class
Egg White	1.48	2
Ovalbumin	1.28	2
Ovomucoid	1.77	2
Conalbumin	0.09	0
Cow's milk	51.3	5
α -lactalbumin	0.79	2
β -lactoglobulin	0.90	2
Casein	3.62	3
Goat's milk	5.29	3
Sheep's milk	7.18	3
Pork	17.9	4
beef	40.4	4
Mutton	21.9	4
Crab	32.6	4
Shrimp	32.5	4
Cod	1.27	2
Wheat	0.47	1
Peanut	0.69	1
Soybean	1.34	2
Sesame	1.19	2
Hazel nut	1.35	2
Brazil nut	0.84	2
Almond	0.76	2
Coconut	0.38	1
Cat dander	0.95	2
Dog dander	1.16	2

Item	IgE(kU/L)	class
D. pteronyssinus	147	6
D. farinae	150	6
Cockroach	17.6	4
total IgE	> 5000	
The detection range of sIgE is 0.00-100.00kU/L, which is divided into classes 0–6 according to the serum sIgE level: class 0(< 0.35kU/L), class 1 (0.35-0.70kU/L), class 2 (0.70-3.50kU/L), class 3 (17.50-50.00kU/L), class 4(50.00-100.00kU/L), class 5(50.00-100.00kU/L), and class 6 ($\geq$ 100kU/L).Class 1 and above ($\geq$ 0.35kU/L) is positive.		

Table 3

the allergen tests results of the infant's elder brother

Item	Level(IU/ml)
total IgE	1790*
D.pteronyssinus	48.63*
D.farinae	18.21*
Dog Dander	< 0.35
Cat Dander	< 0.35
German Cockroach	< 0.35
Mosquito	< 0.35
House Dust	11.40*
Egg	< 0.35
Milk,raw	< 0.35
Wheat flour	< 0.35
Fish	< 0.35
Peanut	< 0.35
Soybean	< 0.35
Crab	< 0.35
Shrimp	< 0.35
*The result is positive.(Test results of the boy's elder brother in the local children's hospital)	

Discussion And Conclusion

In our case, the infant developed eczema a few days after birth, followed by severe skin allergies after the first consumption of ordinary infant formula milk powder. At the age of 3, his food allergen test results and clinical manifestations indicated that his degree of food allergy is increasing. A large number of previous studies had suggested that "atopic march" generally begins with atopic dermatitis and develops into IgE-mediated food allergy, asthma or allergic rhinitis[4]. The boy in our case had allergic reactions to a variety of foods, which increased the risk of respiratory allergic diseases such as asthma and allergic rhinitis[1]. Therefore, we still need to conduct continuous follow-up to observe his development of allergic reactions. Component-resolved diagnostics is a new detection method for the clinical diagnosis of food allergy, which has the capacity to improve the identification of specific clinical phenotypes[5]. Therefore, we would like to discuss the horizontal distribution of sIgE components in milk and eggs in order to assist children with diet adjustment. The allergenicity of some proteins in milk and eggs can be reduced by heating, but casein in milk and ovomucoid in eggs have a good tolerance to heat[6]. In this case, the boy was allergic to heated milk and eggs.

The boy's elder brother response to oyster at the first time when he was 13 years old, which may be a cross-allergic reaction caused by mite allergy. Studies had found that there are cross-reactivities between tropomyosin in molluscs such as oyster and myosin in *D. pteronyssinus* and *D. farinae*[7]. This case report has certain limitations. The degree of clinical allergy symptoms was described by the boy's mother, which was subjective to a certain extent. Due to various reasons, the boy failed to receive Oral Food Challenge.

In conclusion, atopic dermatitis children with multiple food allergies must pay attention to diet adjustment to prevent or delay the development of the disease.

Declarations

Acknowledgment

We thank everyone involved in the collection, storage, transportation, and management of the serum samples.

Author's contribution

B.Q.S was the group leader. B.Q.S and H.M.H conceived and designed the research program. M.Y.W contributed to data collection and wrote the main manuscript text. H.M.H revised and polished the manuscript. All the authors read and approved the final manuscript.

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Availability of data and materials

All data generated or analysed during this study are included in this published article.

Ethics approval and consent to participate

The study was approved by the Ethics Committee of the First Affiliated Hospital of Guangzhou Medical University (Ethical code: GYFYY-2016-73). Serum samples were collected from the Respiratory Diseases Bioresources Center of the National Center for Respiratory Diseases in southern China. Patients had signed the formal written informed consent before their biological samples were entered into the biological resource database. The Ethics Committee of the First Affiliated Hospital of Guangzhou Medical University approved that when using the biological samples from the Respiratory Diseases Bioresources Center of the National Center for Respiratory Diseases.

Consent for publication

Written consent was obtained, and the case report anonymised.

Competing interests

The authors declare that they have no competing interests.

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Figures

Figure 1

Skin symptoms of the boy after drinking semi-hydrolyzed infant formula milk powder

Figure 2

Skin symptoms of the boy after eating pork and flounder.

Figure 3

Skin allergy symptoms of the boy’s elder brother