

Effect of specific immunotherapy induced by *Dermatophagoides farinae* on treatment of children with combined allergic rhinitis and asthma syndrome.

Deli Wang¹, Enqin Zhang², Erbin Xiao^{3*}

¹Department of E.N.T, Taishan Medical University Affiliated Hospital, Taishan, PR China

²Department of E.N.T, Shaanxi Ankang Hospital of Traditional Chinese Medicine, Ankang, PR China

³Department of E.N.T, Affiliated Hospital of Hebei University, Baoding, PR China

Abstract

Objective: To investigate the effect of specific immunotherapy induced by *Dermatophagoides farinae* on treatment of children with combined allergic rhinitis and asthma syndrome.

Methods: From January 2014 to January 2016, 100 cases of children with combined allergic rhinitis and asthma syndrome enrolled in our hospital were selected as the objects. All children were randomly divided into two groups with 50 cases in each group. The patients in the control group were treated with glucocorticoid inhaled. Meanwhile, the patients in the observation group received specific immunotherapy followed by inhaled corticosteroid. Twelve months later, rhinitis control effect, rhinitis symptoms scores, asthma symptom scores and pulmonary function index were analysed and compared between those two groups.

Results: The total effective rate of rhinitis control in the observation group was higher than that in the control group. However, the score of rhinitis symptom in the observation group was lower than that in the control group. The total effective rate of asthma control in the observation group was higher than that in the control group. After treatment, the indexes of pulmonary ventilation function of the two groups were both significantly improved. But, the indexes of pulmonary ventilation function in the observation group were better than those in the control group.

Conclusion: In treatment of children with combined allergic rhinitis and asthma syndrome, specific immunotherapy can effectively control the symptoms of rhinitis and asthma, help to control progression of the disease and significantly improve the lung function of the children.

Keywords: Pediatrics, Allergic rhinitis, Asthma, Specific immunotherapy.

Accepted on October 19, 2017

Introduction

Combined allergic rhinitis and asthma syndrome is a new medical term proposed in recent years of clinical trials. It mainly refers to the coincidence of allergic rhinitis (upper respiratory allergy) with asthma (lower respiratory allergy), occurring more often in the child population. It belongs to atopic disease and exerts a serious impact on the living quality of the children [1-3]. At present, the disease is frequently treated by corticosteroids inhaled in clinical practices yet with the effect not very ideal [4]. Specific immunotherapy is a desensitization therapy and can also be used for treatment of combined allergic rhinitis and asthma syndrome. The purpose of this study is to explore clinical effect of specific immunotherapy in treatment of children with combined allergic rhinitis and asthma syndrome. For this reason, a total of 100 cases of children with combined allergic rhinitis and asthma syndrome treated in our hospital from January 2014 to

January 2016 were enrolled in the randomized controlled trials as reported below.

Materials and Methods

Patients

From January 2014 to January 2016, 100 cases of children with combined allergic rhinitis and asthma syndrome enrolled in our hospital were selected as the objects. All children were randomly divided into two groups with 50 cases in each group. Inclusion criteria: Patients with both allergic rhinitis and asthma; Patients younger than 12 y old; Patients with affected lung function; Patients with the informed consent of the guardians. The study was approved by the ethics committee of the hospital.

Methods

The control group was treated with inhaled corticosteroid: 2 ml budesonide suspension was placed in an aerosol inhalation apparatus. After sufficiently compressed atomization, the children were inhaled by oral and nasal mask twice a day.

The observation group received specific immunotherapy followed by the treatment of glucocorticoid inhaled: children were given sublingual *Dermatophagoides farinae* drops at a fixed time once a day and asked to swallow after 1~3 sublingual min. The concentration was 1 g/ml at the first week, 10 g/ml at the second week, 100 g/ml at the third week and 333 g/ml at the fourth week with the following treatment maintained at this concentration.

Observation index

After 12 months of treatment, the rhinitis control effect, rhinitis symptoms scores, asthma symptom scores and pulmonary function index were compared between the two groups. The effect of rhinitis control was evaluated in accordance with reduction rate of score of rhinitis symptoms including sneezing, nasal congestion, nasal itching and runny nose with a single score of 1~3 and a total score of 4~12, the higher the score, the more severe the symptoms of rhinitis. The decrease of rhinitis symptom score by more than 66% turned out to be significant effect, by 25%~66% effective and by less than 25% invalid [5] with "the total effective rate=the rate of significant effect+effective rate"; asthma control effect was assessed by means of Asthma Control Test (ACT scale) with a full score of 25, the higher the score, the better the asthma control. The score of 25 suggested the full control, 20~24 partial control and the score less than 20 indicated a failure of control [6] with "total control rate=full control rate+partial control rate"; Indexes of pulmonary ventilation function include Forced Expiratory Volume (FEV1) in 1 s, ratio of Forced Expiratory Volume and Forced Vital Capacity in 1 s (FEV1/FVC).

Statistical analysis

Counting data were expressed by "n, %" and measurement data by mean \pm standard deviation. Chi square test and t test were carried out on SPSS 19.0 software. $p < 0.05$ suggests that the difference is statistically significant.

Results

Comparison of rhinitis control

The total effective rate of rhinitis control in the observation group was higher than that in the control group and after the treatment the scores of rhinitis symptoms in the observation group were significantly lower than that in the control group (Tables 1 and 2).

Table 1. Comparison of total effective rate of rhinitis control.

Group	n	Significantly effective	Effective	Invalid	Total effective rate
Control	50	16 (32%)	25 (50%)	9 (18%)	82%
Observation	50	21 (42%)	27 (54%)	2 (4%)	96%

Table 2. Comparison of scores of rhinitis symptoms.

Group	Before treatment	After treatment
Control	7.16 \pm 1.05	8.47 \pm 1.38
Observation	7.28 \pm 1.03	10.19 \pm 1.57

Comparison of asthma control

The total effective rate of asthma control in the observation group was higher than that in the control group and after treatment the score of asthma symptoms in the observation group was significantly lower than that in the control group (Tables 3 and 4).

Table 3. Total effective rate of asthma control.

Group	n	Full control	Partial control	Failure of control	Total effective rate
Control	50	15 (30%)	24 (48%)	11 (22%)	78%
Observation	50	19 (38%)	28 (56%)	3 (6%)	94%

Table 4. Comparison of asthma symptom scores.

Group	Before treatment	After treatment
Control	16.35 \pm 2.37	19.04 \pm 2.69
Observation	16.52 \pm 2.21	21.56 \pm 2.74

Comparison of pulmonary ventilation function indexes

After treatment, the pulmonary ventilation function indexes of the two groups were significantly improved when compared with the result before treatment (Table 5).

Table 5. Comparison of pulmonary ventilation function indexes.

Group	Time	FEV1 (L)	FEV1/FVC (L)
Control	Before treatment	0.89 \pm 0.42	32.54 \pm 9.34
	After treatment	0.91 \pm 0.15	43.12 \pm 11.03
Observation	Before treatment	0.81 \pm 0.45	33.09 \pm 9.13
	after treatment	2.09 \pm 0.69	58.94 \pm 15.67

Discussion

Combined allergic rhinitis and asthma syndrome is a common chronic airway hyperresponsiveness disease during the childhood. It mainly refers to the occurrence of both allergic rhinitis and asthma at the same time, including sneezing, nasal

congestion, nasal itching and runny nose, wheezing, cough with repeated attack and long duration, which causes serious impact on the children's daily life. What is worse, repeated exposure to allergens is likely to result in the aggravation of illness condition of the children and even make them carry the disease to their adulthood when the slightly damaged pulmonary function would develop into irreversible pulmonary ventilation dysfunction, posing a threat to the life safety of the patients [7-11]. As a result, active and positive treatment is required in the clinical trials for the children with combined allergic rhinitis and asthma syndrome.

At present, the children with combined allergic rhinitis and asthma syndrome are often given corticosteroids inhaled treatment in which budesonide, one of the frequently used drugs, enables to effectively combine with the receptors of glucocorticoid to play powerful function of local anti-inflammatory. It also acts as an inflammatory cell mediator in the airways and effectively inhibits the inflammatory response within. But this kind of treatment can control the symptoms of combined allergic rhinitis and asthma syndrome only for the moment and fails to cure rhinitis or asthma followed by the possibility of relapsing after withdrawal [12-15].

Specific immunotherapy belongs to desensitization and becomes an important means applied to recent years of clinical treatment for children with combined allergic rhinitis and asthma syndrome. In this course, the children are mainly given allergenic extract to gradually enhance the tolerance to allergens as a gradual increase in the dose of the extract. In this way, the patient will no longer have allergies after stopping the drug even after re-exposure to the allergen. This is currently the only treatment method and also an important method recommended by the WHO to cure combined allergic rhinitis and asthma syndrome, frequently applied to the allergic rhinitis and asthma syndrome caused by dust mite allergens by way of *Dermatophagoides farinae* drops treatment [16-20]. In this study, we found that the total effective rate of rhinitis control in the observation group was higher than that in the control group and after the treatment the scores of rhinitis symptoms in the observation group were significantly lower than that in the control group and that the total effective rate of asthma control in the observation group was higher than that in the control group and after treatment the score of asthma symptoms in the observation group was significantly lower than that in the control group, fully explaining the effectiveness of specific immunotherapy in treatment of children with combined allergic rhinitis and asthma syndrome. In addition, we also found that after the treatment lung function indexes of the observation group were significantly better than those of the control group, showing that specific immunotherapy can improve the pulmonary ventilation function of the child patients with combined allergic rhinitis and asthma syndrome.

In summary, the application of specific immunotherapy for treatment of combined allergic rhinitis and asthma syndrome can effectively control the symptoms of rhinitis as well as asthma, helps to control the disease and significantly improves the pulmonary ventilation function of children.

References

1. Yilmaz O, Bakirtas A, Ertoy Karagol HI. Allergic rhinitis may impact the recovery of pulmonary function tests after moderate/severe asthma exacerbation in children. *Allergy* 2014; 69: 652-657.
2. Wang C, Wang X, Zhang W. Long-term efficacy of *Dermatophagoides pteronyssinus* immunotherapy in patients with allergic rhinitis: a 3-year prospective study. *Chinese J Otorhinolaryngol Head Neck Surg* 2012; 47: 804-808.
3. Profita M, Riccobono L, Bonanno A. Effect of nebulized beclomethasone on airway inflammation and clinical status of children with allergic asthma and rhinitis: A randomized, double-blind, placebo-controlled study. *IntArch Allergy Immunol* 2013; 161: 53-64.
4. Huang H, Liu X, Hou X. Effects of airway hyperresponsiveness and dust mite allergen immunotherapy combined with drug therapy on the children with allergic rhinitis. *J Capital Med Univ* 2016; 37: 568-573.
5. Liu X, Wang Q, Huang H. Clinical observation of dust mite specific immunotherapy for treatment of children with bronchial asthma and allergic rhinitis. *Shandong Med J* 2016; 56: 5-8.
6. Wang J, Fu Y, Wang Q. Distribution characteristics and clinical significance of specific immunoglobulin E of 29 kinds of food and inhalation allergens in atopic dermatitis children. *Clin Pract Pediatr* 2014; 29: 289-294.
7. Mahmoud FF, Haines D, Al-Awadhi R. In vitro suppression of lymphocyte activation in patients with seasonal allergic rhinitis and pollen-related asthma by cetirizine or azelastine in combination with ginkgolide B or astaxanthin. *Acta Physiologica Hungarica Period Hungarian Acad Sci* 2012; 99: 173-184.
8. Chen S, Zeng X, Wang L. Observation on the curative effect of different treatment courses of sublingual *Dermatophagoides Farinae* Drops in the case of children with allergic rhinitis and asthma. *Chinese J Otorhinolaryngol Head Neck Surg* 2015; 50: 627-631.
9. Maslova E, Strom M, Oken E. Fish intake during pregnancy and the risk of child asthma and allergic rhinitis-longitudinal evidence from the Danish national birth cohort. *Br J Nutr* 2013; 110: 1313-1325.
10. Zhang W, Zhang S, Sun L. Analysis on pulmonary function and epidemiology of 184 patients with combined allergic rhinitis and asthma syndrome. *J Guizhou Med Univ* 2016; 41: 1340-1346.
11. Ciprandi G, Tosca MA, Capasso M. High exhaled nitric oxide levels may predict bronchial reversibility in allergic children with asthma or rhinitis. *J Asthma* 2013; 50: 33-38.
12. Liu J, Zhang X, Feng H. Analysis on influence factors of specific immune efficacy of dust mite in treatment of children with asthma. *Chinese J Contemp Pediatr* 2013; 15: 854-859.

13. Wang S, Zheng Y, Lv Z. Effect of specific immunity in treatment of children with allergic rhinitis combined with asthma. *Chinese Med J PLA* 2016; 28: 65-68.
14. Ding L, Chen J, Li L. The change and clinical effect of IL-17 and IL-35 levels in children with allergic rhinitis/allergic asthma under sublingual specific immunotherapy. *Chinese J Contemp Pediatr* 2014; 12: 1206-1210.
15. Deng X, Yuan M. Comparison on the effects of sublingual immunotherapy for preschool and school children with allergic asthma and rhinitis. *J Med Res* 2015; 44: 73-77.
16. Lai X, Li J, Xiao X, Liu E, Zhang C. Specific IgG4 production during house dust mite immunotherapy among age, gender and allergic disease populations. *Int Arch Allergy Immunol* 2013; 160: 37-46.
17. Chen WL, Liao F. Efficacy of sublingual immunotherapy with *Dermatophagoides farinae* drops in preschool and school-age children with allergic asthma and allergic rhinitis. *Chinese J Pediatr* 2013; 51: 831-835.
18. Huang H, Liu X, Wang J. The different ways of dust mite specific immunotherapy on the effects of early immunological indexes in children with asthma. *Chinese J Pract Pediatr* 2016; 31: 1665-1667.
19. Dong G, Jia Y. Evaluation of standardized *Dermatophagoides Farinae* drops specific immunotherapy for treatment of children at different periods of allergic asthma and allergic rhinitis. *Chinese J Postgrad Med* 2014; 37: 52-54.
20. Wang J, Li Y. Pay, distribution and clinical significance of specific immunoglobulin E in treatment of children with bronchial asthma and allergic rhinitis of multiple sensitizing factors. *Chinese J Appl Clin Pediatr* 2013; 28: 1216-1220.

***Correspondence to**

Erbin Xiao
 Department of E.N.T
 Affiliated Hospital of Hebei University
 PR China