Bronchial asthma in the elderly. Relationship to allergic reaction and airway inflammation

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Abstract: Clinical features of bronchial asthma in the elderly were analyzed by observing IgE-mediated allergic reactions evaluated by immediate skin reaction and specific IgE antibodies to allergens, ventilatory function and cellular composition in bronchoalveolar lavage (BAL) fluid. 1. The frequency of positive immediate skin reaction and positive RAST score to allergens was in general low in the elderly patients over age 70. 2. Ventilatory function was widely variegated, and fifteen cases (60%) of the 25 subjects showed considerably high values of FEV₁₅₀, %PEFR, %MMF, %V₂₅ and %V₅₀, and the mean value of FEV₁₅₀ in these cases was 71.3%. 3. The decreased value of %V₂₅ was related to BAL neutrophilia in 2 cases, but any correlation was not found between BAL neutrophilia and decreased value of %V₂₅ in 9 cases of the eleven subjects who had the BAL examination. The results show that in asthma of elderly patients, IgE-mediated allergic reactions are weak, and that a decreased value of %V₂₅ can be observed without BAL neutrophilia.

Key words: elderly subjects, IgE-mediated allergic reaction, ventilatory function, BAL neutrophilia, bronchial asthma

Introduction

It is widely accepted that the majority of atopic asthma in young subjects begins to occur before the age of 10. In atopic asthma, IgE-mediated allergic reactions can be usually observed¹,². The reaction is evaluated by high levels of serum IgE, positive skin reaction and positive RAST score of 2+ or more to allergens, bronchial provocation test and basophil histamine release induced by allergen and anti-IgE³-⁶.

Two major changes have been suggested in the elderly patients with bronchial asthma⁷.
The first one is the changes of allergic reactions with aging, which play the major role in the onset mechanism of bronchial asthma. The second one is the organic change of the airways with aging, in which the organic change is mainly found in the peripheral lung regions including small airways. Thus, bronchial asthma in the elderly is characterized by the changes of allergic reaction and of airway structure with aging.

In the present study, characteristics of bronchial asthma in the elderly were observed in relation to age at onset of the disease, IgE-mediated allergic reaction, ventilatory function and airway inflammation represented by cells in bronchoalveolar lavage (BAL) fluid.

Subjects and Methods

For this study, 25 elderly patients with bronchial asthma over the age of 70 were selected. Their mean age was 72.2 years with a range of 70 to 80 years. Of these, 12 were females and 13 were males. The mean level of serum IgE was 417 IU/mL (range, 14–2007 IU/mL). Their asthma is not so severe, and 4 patients (16%) had been on corticosteroid therapy for over two years.

Immediate skin reaction was examined with 0.02 mL of commercial allergen extract (Torii Pharmaceutical Co). The diameters of flare and wheal at 20 min were measured in millimeters after the test. The diameter of flare larger than 20 mm or wheal larger than 9 mm was regarded as positive. Allergens used for skin reaction were house dust (HD), ragweed, silk, Japanese cedar (JC), Candida (Ca), Alternaria and Aspergillus.

BAL cytology was examined in eleven subjects by differentiating 500 cells excluding epithelial cells on smear preparations. The results were expressed as a percentage of the total cells. Informed consent for the BAL examination was obtained from study subjects.

Ventilatory function was measured by using a Box Spiror 81 (Chest Co) when they were attack free.

Serum IgE was determined by radioimmunosorbent tests (RIST). Specific IgE antibodies were estimated by radioallergosorbent test (RAST).

Results

1. Allergic reaction

The level of serum IgE was widely variegated, and a low level of serum IgE under 100 IU/mL was found in 9 cases (36%), while a high level over 500 IU/mL in 7 cases (28%) of the 25 subjects. Immediate skin reaction to allergens was positive in one case (4%) to house dust, 6 cases (24%) to Candida and 3 cases (12%) to Japanese cedar. A positive RAST score to allergens was found in 2 cases (8%) to HD and in 2 cases (8%) to Ca.

2. Age at onset of bronchial asthma

Age at onset of the disease in these subjects was considerably high. Their asthma attacks began most frequently to occur between the ages of 51 and 60. The age at onset was between 41 and 50 in 4 cases, between 51 and 60 in 7 cases, between 61 and 70 in 6 cases and over age 71 in 4 cases. The results reveal that asthma attacks in the patients over age 70 start between the ages of 41 and 50, and the initiation of the attacks is most frequently found between 51 and 60 (Fig. 1).
3. Ventilatory function

It has been suggested that bronchial asthma in the elderly shows ventilatory dysfunction in the small airways. In the present study, the value of %V25 less than 10% was observed in 10 cases (40%) of the 25 subjects, while 15 cases (60%) showed the value over 10%. Ventilatory parameters other than %V25 were compared between the subjects with the value of %V25 more than 10% (group A) and less than 10% (group B).

The ventilatory parameters such as FEV1.0%, %PEFR, %MMF and %V25 were significantly lower in group B than in group A, although no significant difference was present in the value of %FVC between the two groups. The values of ventilatory parameters representing obstructive ventilatory dysfunction were considerably high, and the mean value of FEV1.0% in the patients of group A was 71.3% (Fig. 2, Table 1.).

4. Cellular composition in BAL fluid

The proportion of macrophages and lymphocytes in the BAL fluid was not different between the subjects with the value of %V25 more than 10% (group A) and less than 10% (group B). The proportion of BAL neutrophils was significantly higher in group B than in group A (p<0.02). BAL neutrophilia was not observed in all of the six subjects of group A, and found in 2 cases of the five subjects of group B. On the contrary, the frequency of eosinophils in the BAL fluid was higher in group A compared with group B, although no significant difference was present between the groups A and B (Fig. 3).
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Age at onset of the disease in the elderly subjects was higher, and in 21 cases (84%) of the 25 subjects, the age at onset was over age 41. The results reveal that asthma in the elderly subjects newly occurs after the age over 41, but does not continue from their childhood.

Ventilatory function in the elderly subjects is characterized by dysfunction in the peripheral lung region including bronchiholes, which is related to BAL neutrophilia and to aging. The data from this study demonstrate that the dysfunction in the peripheral lung region (expressed by the value less than 10%) of the elderly subjects is related to BAL neutrophilia in 2 cases and to aging in 9 cases of the eleven subjects receiving the BAL examination.

The results obtained here might show that bronchial asthma in the elderly is characterized by decrease of IgE-mediated allergic reaction and dysfunction in the small airways, which is partially caused by BAL neutrophilia and mainly by aging.

Discussion

It has been considered that bronchial asthma in the elderly is different in several points from that in young adults. IgE-mediated allergic reactions, which participate in the onset mechanism of asthma and ventilatory function, which is affected by the pathophysiology of the airways, change with aging. In the present study, the two major changes by aging were examined.

IgE-mediated allergic reactions evaluated by immediate skin reaction and RAST score to allergens were in general weak in the elderly subjects over age 70, although high levels of serum IgE over 500 IU/ml were observed in 7 cases (28%) of the 25 subjects. Furthermore, specific IgE antibodies to allergens was present in only two cases (28.6%) of the seven subjects with serum IgE over 500 IU/ml.

References

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