◎原 著

Bronchial asthma in the elderly. Ventilatory function in each clinical asthma type.

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Abstract : Ventilatory function was examined in 20 elderly patients with bronchial asthma in relation to clinical asthma types, and the results were compared with those of younger asthmatics. 1. Ventilatory parameters such as $FEV_{1.0\%}$, %PEFR, %MMF, $\%\dot{V}_{50}$ and $\%\dot{V}_{25}$, which repressent obstructive ventilatory dysfunction, were in general lower in older asthmatics than in the youger cases. 2. The values of $\%\dot{V}_{50}$ and $\%\dot{V}_{25}$, representing ventilatory dysfunction in small airways, were significantly lower in the older subjects with type Ib and II compared to the younger cases with same types. 3. Markedly decreased values in ventilatory parameters, particularly in %MMF, $\%\dot{V}_{50}$ and $\%\dot{V}_{25}$ were observed in both older and younger subjects with type II.

The results suggest that ventilatory function decreases with aging and the decrease is related to the pathophysiological changes in the airways.

Key words : Ventilatory function, small airways, clinical asthma types, elderly asthmatics

Introduction

IgE-mediated allergic reactions are observed in many cases of younger asthmatics[1, 2]. In these cases, allergen-specific IgE antibodies or high levels of total IgE in sera are found. Thus, a correlation between IgE-mediated allergic reaction and pathophysiological changes in the airways of asthma has been extensively studied. On the contrary, the pathogenesis is still unclear in several cases of elderly patients with bronchial asthma. In some elderly subjects, it is difficult for physicians to find the presence of IgE-mediated allergic reaction, although it has been proposed that asthma is a disease caused by IgE[3]. Furthermore, it has been shown that basophil reactivity to allergen and anti-IgE is different

between younger and older asthmatics[4~8], and that the incidence of specific IgE antibodies for house dust and Candida albicans is also different between them[9]. These results suggest that one of the characteristics in elderly asthmatics is due to the quantitative and qualitative changes of allergic reactions.

Another characteristic of asthma in elderly subjects is related to pathophysiological changes of the airways with aging. Airway reaction during asthma attacks mainly ocmprises bronchoconstriction, hypersecretion and edema of mecous membrane. In addition to these pathophysiological changes in airways, changes in small airways, narrowing and obstruction of bronchioles, are often observed in elderly asthmatics[10].

In the present study, characteristics of ventilatory function in elderly asthmatics was examined in each clinical asthma type compared with younger subjects.

Subjects and Methods

The subjects were 20 elderly patients with bronchial asthma whose age was 60 years or older. Of these patients, 12 were females and 8 were males. Their mean age was 66.7 years with a range of 60 to 74 years. The mean level of serum IgE was 203±271 IU/mℓ (±sd). Twenty younger asthmatics, 10 females and 10 males, whose mean age was 44.9 years with a range of 24 to 58 years, were selected as control subjects. The mean level of serum IgE in the younger asthmatics was 504±661 IU/mℓ.

Ventilatory function was examined in all subjects during attack-free stages using a Box sprior 81−S (Chest Co). Ventilatory parameters such as %FVC, $FEV_{1.0\%}$, %PEFR, %MMF, $\%\dot{V}_{50}$ and $\%\dot{V}_{25}$ were used for comparison in ventilatory function between younger and older subjects.

The subjects were classified into three clinical asthma types according to the criterion previously described[10~13]. The criterion was as follows. Ia. simpie bronchoconstriction type : cases, whose symptoms, wheezing and dyspnea, are mainly elicited by bronchoconstriction. Ib. bronchoconstriction+hypersecretion type : cases, whose symptoms are due to hypersecretion (more than 100mℓ/day of expectoration), in addition to bronchoconstriction. II. bronchiolar obstruction : cases, whose symptoms are mainly elicited by bronchiolar obstruction.

Results

1. Ventilatory function in younger and older subjects

The value of %FVC was not significant between the younger and the older subjects. The values of the other ventilatory parameters were lower in the older subjects compared with the younger cases, although a significant difference was not found in the other ventilatory parameters except $\%\dot{V}_{50}$ between the two groups. The $\%\dot{V}_{50}$ value in the older subjects was significantly lower than the value in the younger cases ($p<0.01$)(Table 1).

Table 1. comparison of ventilatory function between younger and older subjects with bronchial asthma.

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Age, years	No of cases	Ventilatory parameters %FVC	$FEV_{1.0\%}$	%PEFR	%MMF	$\%\dot{V}_{50}$	$\%\dot{V}_{25}$
0-59	20	94.5* ±19.9	70.0 ±12.6	84.7 ±28.3	44.3 ±24.3	40.2 ±23.5	28.4 ±28.3
60+	20	95.1 ±26.2	67.1 ±12.6	71.4 ±30.3	33.8 ±17.2	20.3 ±15.2	19.5 ±12.7

*Mean ± sd

2. Ventilatory function in each clinical asthma type

1) Ia. simple bronchoconstriction type

The values of %FVC and $FEV_{1.0\%}$ were within normal range in both younger and older subjects with type Ia. The values of the other ventilatory parameters such as %PEFR, %MMF, $\%\dot{V}_{50}$ and $\%\dot{V}_{25}$ were lower in the older subjects than in the younger cases, although the difference was not significant between the two age groups.

2) Ib. bronchoconstriction + hypersecretion type

The value of %FVC was normal and no different between the younger and the older subjects. The values of $FEV_{1.0\%}$ and %PEFR, which may represent ventilatory dysfuction in large airways, was lower in the older subjects than in the younger cases, although the difference was not significant. Out of the six ventilatory parameters, %MMF, $\%\dot{V}_{50}$ and $\%\dot{V}_{25}$, which may represent ventiletory dysfunction in small airways, the values of $\%\dot{V}_{50}$ and $\%\dot{V}_{25}$ in the older subjects were significantly lower than the values in the younger cases (both, $p<0.02$). The results suggest that elderly asthmatics show more decreased ventilation in small airways compared with younger asthmatics.

3) II. bronchiolar obstruction

The values of %FVC, $FEV_{1.0\%}$, %PEFR and %MMF were similar between the younger and the older asthmatics. The values of $\%\dot{V}_{50}$ and $\%\dot{V}_{25}$ in the older subjects were significantly lower than the values in the younger cases (both, $p<0.05$). (Fig. 1).

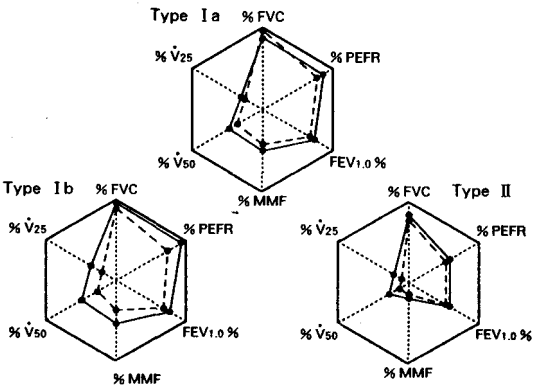

Fig. 1. Ventilatory function in each clinical asthma type of bronchial asthma in relation to patient age.
•——• : cases 0 to 59 years,
•- - -• : cases 60+years

3. Comparison of ventilatory function among clinical asthma types.

The values of all ventilatory parameters were lower in the subjects with type II asthma compared to the values in the cases with type Ia and Ib in both younger and older groups. Out of these parameters, the value of $FFV_{1.0\%}$ in type II asthma was significantly lower than the value in type Ia (younger cases, $p<0.02$ and older cases, $p<0.05$). The values of %MMF and $\%\dot{V}_{50}$ in the type II cases were also significantly lower than the values in the type Ia cases among the older subjects ($p<0.05$). In the younger subjects, the value of $\%\dot{V}_{50}$ was significantly lower in the type II cases than in the type Ia cases ($p<0.05$). Any significant difference was not found in the value of %PEFR among three asthma types. Ventilatory function was not different between type Ia and type Ib cases of the two age groups (Fig. 1).

Discussion

Bronchial asthma is characterized by tran-

sient narrowing and obstruction of airways, which are mainly caused by bronchoconstriction, mucus hypersecretion, edema of mucous membrane and bronchiolar obstruction. Our previous studies have demonstrated that patients with bronchial asthma can be divided into three types according to chinical symptoms and signs[10~13]. In this asthma classification, clinical symptoms are different among three asthma types ; dyspnea with marked wheezing is observed in type Ia , dyspnea with wheezing and hypersecretion in type Ib, and marked dyspnea without wheezing in type II. The different symptoms among three asthma types are due to the different pathophysiological changes in the airways of asthmatics.

In the present study, a correlation between pathophysiological changes in airways and ventilatory function was exemined in younger and older subjects. Ventilatory parameters such as $FEV_{1.0\%}$, %PEFR, $\%\dot{V}_{50}$ and $\%\dot{V}_{25}$ showing obstructive ventilatory dysfunction were in general lower in the older subjects, and the value of $\%\dot{V}_{50}$ was significantly lower in the older subjects compared with the younger cases. Relating to the difference in ventilatory function between younger and older subjects in each asthma type, any ventilatory parameters were not different between the two age groups of type Ia. While the vaiues of $\%\dot{V}_{50}$ and $\%\dot{V}_{25}$ were significantly lower in the older subjects than in the younger cases when they were type Ib or type II asthmatics. In comparison of ventilatory function among clinical asthma types, the values of ventilatory parameters such as $FEV_{1.0\%}$, %MMF, $\%\dot{V}_{50}$ and $\%\dot{V}_{25}$ were significantly lower in type II cases compared with type Ia cases among the elderly asthmatics. Of these parameters, the values of %MMF, $\%\dot{V}_{50}$ and $\%\dot{V}_{25}$ were more decreased in the type II cases of the two age groups compared with the type Ia and Ib cases. That is, patients with type II asthma show a marked decrease in the value of %MMF, $\%\dot{V}_{50}$ and $\%\dot{V}_{25}$.

It is more difficult for physicians to treat these patients with type II , because there is no effective medication except corticosteroids to improve bronchiolar obstruction. Spa therapy is effective in these patients with type II as previously described[14, 15]. The results reveal that ventilatory function in younger and older asthmatics is influenced by pathophysiological changes in airways, particularly bronchiolar obstruction and by aging.

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老令者の気管支喘息，各臨床病型における換気機能の特徴

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60才以上の老年気管支喘息20例（平均年令；66.7才）を対象に，その換気機能について，臨床病態別に59才以下の症例（平均年令；44.9才）との比較検討を行った。

1．$FFV_{1.0\%}$，%PEFR，%MMF，$\%\dot{V}_{50}$，$\%\dot{V}_{25}$などの閉塞性換気障害を表すパラメーターは，59才以下の症例に比べ老年症例で全般的に低い傾向が見られた。

2．小ないし細気管支領域の換気機能を反映すると考えられる$\%\dot{V}_{50}$および$\%\dot{V}_{25}$は，Ib型およびII型喘息を示す老年症例において，59才以下の症例に比べ，有意に低い値を示した。

3．II型喘息症例では，59才以下および老年症例のいずれにおいても，%MMF，$\%\dot{V}_{50}$および$\%\dot{V}_{25}$は他の臨床病型にくらべ著明に低い値を示した。

これらの結果は，気管支喘息における換気機能は，加令とともに低下傾向を示すこと，そしてその低下は臨床病態と関連していることを示しているものと考えられた。

キーワード：換気機能，細気管支，臨床病型，老年者気管支喘息