

Perception of Wheezing in the Elderly Asthmatics

Jae Hak Joo, M.D., Gun Il Lim, M.D., Moon Jeong Seo, M.D.,
Sang Joon Park, M.D., Jun Hyek Lee, M.D., Soo Taek Uh, M.D.,
Yong Hoon Kim, M.D. and Choon Sik Park, M.D.

*Department of Internal Medicine, College of Medicine,
Soon Chun Hyang University, Seoul, Korea*

Background : *In elderly asthmatics, underdiagnosis is one of the important features. The main reason for underdiagnosis is thought to be a low frequency in complaining of symptoms due to the reduction of intellectual recognition and physical activity. Among the various symptoms, wheezing is the principal clue in diagnosing bronchial asthma, and decreased complaints for wheezing are also noted in elderly asthmatics. The objective of this study is to determine if less complaints of wheezing in elderly asthmatic is due to a decrease in the development of wheezing.*

Methods : *61 young (20-39 years old), 68 middle-aged (40-59 years old) and 65 elderly (older than 60 years old) stable asthmatic subjects were studied (each group shall be called, hereafter, Young Group, Middle-aged Group and Old Group, respectively). During the methacholine induced airway narrowing, lung auscultation and questionnaire survey about presence and perception of wheezing were conducted in 194 asthmatics.*

Results : *One hundred and sixty-nine patients (87%) developed wheezing during the methacholine induced airway obstruction. The frequency of wheezing during the methacholine challenge was found to be comparable among the groups. The methacholine concentration, % fall in FEV1, and FEV1 levels of the initial detection of wheezing were not different among the groups. Among the patients who developed wheezing, 47 patients (77%), 42 patients (61.8 %) and 26 patients (40%) complained of wheezing in Young, Middle and Old Group, respectively.*

Conclusion : *In conclusion, the decreased perception of wheezing is a main factor for the low frequency of complaints of wheezing in elderly asthmatics.*

Key Words : *Asthma; Wheezing; Elderly Asthmatics*

INTRODUCTION

Among the three main symptoms of cough, dyspnea and wheezing indicating bronchial asthma, cough and dyspnea are non-specific symptoms that may be caused by other chronic respiratory diseases. Accordingly, the complaints of wheezing by patients and the presence of audible wheezing are important clues to diagnose asthma.

Yet, with regard to the reversible airway obstruction as one of the features of asthma, wheezing is also developed reversibly and, as a result, its underdiagnosis is very common in spite of a prior presence of wheezing in the past medical history.

As the old increase, elderly asthmatics have been increasing gradually. But an exact diagnosis of elderly asthmatics may be delayed¹⁾, mainly because of the low frequency in complaining of asthma symptoms, including cough, dyspnea, wheezing and so forth²⁾. We previously reported that elderly asthmatics of 60 years and up do not complain of symptoms of asthma and the frequency of wheezing is significantly lower than that of young-aged patients³⁾. The decrease in complaining of wheezing in the elderly group is attributed to a decline in physical

*Address reprint requests to : Choon Sik Park, M.D.,
Department of Internal Medicine, College of Medicine,
Soon Chun Hyang University, 1174 Jung-Dong, Wonmi-gu,
Buchun, Kyonggi-do, Korea, 420-853*

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activities, as compared with young/middle-aged groups. In addition, the reduction of perception ability also can be a main reason for less complaints of asthmatic symptoms. However, It is not clear whether wheezing rarely develops in the elderly asthmatics, compared with the young age groups, or that the elderly patients cannot perceive wheezing regardless of its presence. Therefore, this study attempts to reveal the difference between the rate of wheezing development and the wheezing perception by age in the state of bronchoconstriction by conducting the methacholine inhalation in asthmatics.

PATIENTS AND METHODS

194 study subjects, who visited the Allergy and Respiratory Departments from January, 1999 to June, 1999, were the subjects of the methacholine challenge test. All of them met the definition of asthma proposed by the American Thoracic Society⁴⁾. The patients with chronic stable asthma were grouped from mild-intermittent to severe-persistent asthma according to the asthma severity scale proposed by the National Asthma Education and Prevention Program⁵⁾. They had no history of upper respiratory tract infection during the four weeks prior to the study. Asthmatics were classified into three groups by age: Young Group (20-39 years old), Middle-aged Group (40-59 years old), Old Group (of 60 years and up).

1. Methacholine induced airway obstruction

Inhalation of methacholine aerosol was performed by tidal breathing method for 2 minutes at each step using a nebulizer (De Vibiss series No 646). The basal FEV1 was measured first and then remeasured in 60 and 120 seconds after inhaling saline. The highest value among them was used as a basal control. Each aerosol of methacholine concentration 0.075 mg/mL, 0.15 mg/mL, 0.31 mg/mL, 0.62 mg/mL, 1.25 mg/mL, 2.5 mg/mL, 5 mg/mL, 10 mg/mL or 25 mg/mL was inhaled at 5-minute intervals. In 180 seconds after inhalation of each methacholine concentration, FEV1 was checked again; in case of FEV1 reduction over 20% compared with the control value, the test was stopped. The change of lung function during the methacholine inhalation was recorded in FEV1 percent fall from the basal FEV1. FEV1% fall was calculated in the formula of [(basal FEV1 - FEV1 after the methacholine challenge test) / basal FEV1] × 100(%).

2. Detection of wheezing development and its perception

The development of wheezing was detected through

auscultation by a skilled operator. Auscultation was performed at left and right top and 4 bottom parts on the back when the patient was taking a deep breath, prior to the methacholine inhalation, two minutes after the inhalation of each methacholine concentration and immediately prior to the inhalation of the next methacholine concentration. The patient's perception of wheezing was checked also at the same time of auscultation.

The group which did not show a wheezing symptom until FEV1 decreased over 20% was considered as negative and a comparison was made between groups by age. In the group having the development of wheezing, the subjects were compared by age in regards to methacholine concentration to produce wheezing, % fall of FEV1 and FEV1% at the initial detection of wheezing by auscultation (the threshold of wheezing development). In addition, the difference in perception of wheezing developed was explored by comparing the samples where the patients in the wheezing group perceived audible wheezing until the test was completed (the perception rate).

3. Statistical analysis

For the statistical analysis, SPSS 7.5 for Windows program was used. The presence and the perception of wheezing by age were compared by the chi-square test, the wheezing-present group and the non-wheezing group were compared by the student *t*-test and the comparison of lung function at the initial detection of wheezing was made by variance analysis. Every value was represented in average and standard deviation and if *p* was less than 0.05 and below such values were regarded as statistically significant.

RESULTS

1. Differences in development and perception of wheezing between different age groups

169 (87%) out of 194 patients developed wheezing on auscultation during the methacholine provocation test, and 25 did not develop any wheezing though FEV1 decreased over 20%. The development rates of wheezing by age were not different among Young Group, Middle-aged Group and Old Group, each of which was 86.9%, 88.2% and 86.2%. But the perception ratio of wheezing declined in reverse proportion to the rise of age by 77.0%, 61.8% and 40.0%, respectively. This indicates, therefore, that there is little difference in developing

wheezing but there is a decrease in the perception of wheezing, as the subjects are older (Table 1).

Table 1. Characteristics of patients

	Young	Middle age	Old
N (MF)	61 (36:25)	68 (26:42)	65 (27:38)
Age	28.8 (20-39)	49.8 (40-59)	66.4 (60-)
PC20	1.19 ± 1.18	1.73 ± 0.24	1.39 ± 0.23
FEV1 (%pred)	94.1 ± 2.5*	88.0 ± 2.1*	84.3 ± 1.7*
Wheezing [†]	53 (86.9%)	60 (88.2%)	56 (86.2%)
Perception [‡]	47 (77.0%)*	42 (61.8%)*	26 (40.0%)*

* $p < 0.05$

[†] The number of patients who developed wheezing during methacholine challenge test

[‡] The number of patients who were perceived wheezing among the patients who developed wheezing during methacholine challenge test

As the result of the comparison of the basal FEV1 between the wheezing group and the non-wheezing group by age, there was no significant difference ($p < 0.05$) Young- 97.3%:91.3%, Middle-aged- 91.7%:87.5%, Old- 92.1%:83.4%). As the PC20 methacholine values were remarkably low in the wheezing group ($p < 0.05$), it was presumed that increase of airway hypersensitivity induced the earlier airway obstruction in the wheezing group (Table 2).

Table 2. Characteristics of patients with or without

	Wheezing +	Wheezing -
N	169 (87%)	25 (13%)
Age	51.0 (28-80)	48.4 (20-79)
FEV1 (%pred)	87.2 ± 0.11*	93.6 ± 0.31*
PC20	1.33 ± 0.12*	2.22 ± 0.56*

* $p < 0.05$

2. Increase in the comparison of lung function change in the presence of wheezing between different age groups

For the purpose of an inquiry into the reliance of the presence of wheezing upon the airway obstruction and the effects of FEV1% fall, we measured FEV1% fall and FEV1% at the initial detection of wheezing after inhalation of methacholine. In the wheezing group, the respective values of FEV1% fall by age were $15.75 \pm 1.65\%$, $13.72 \pm 12.84\%$ and $16.04 \pm 1.15\%$, showing no significant differences among them ($p < 0.05$). The respective values of FEV1% were $74.58 \pm 2.02\%$, $75.19 \pm 2.38\%$ and $69.29 \pm 1.81\%$ in each group, Young Group, Middle-aged Group and Old Group, respectively, thus showing no

significant differences among such groups ($p > 0.05$, Figure 1, 2). A comparison of the methacholine concentrations at the initial detection of wheezing was made in order to observe the differences of the airway reaction to methacholine by age but found no remarkable differences among the groups ($p > 0.05$, Figure 3).

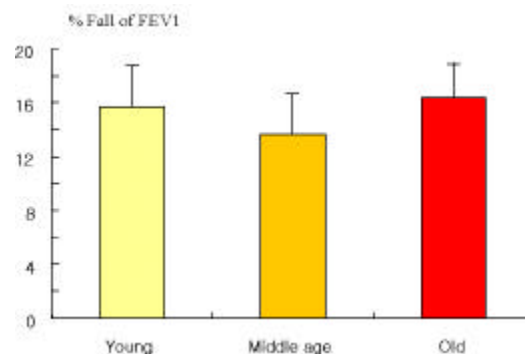


Figure 1. Percentage Fall of FEV1 at first detection of wheezing in patients according to age

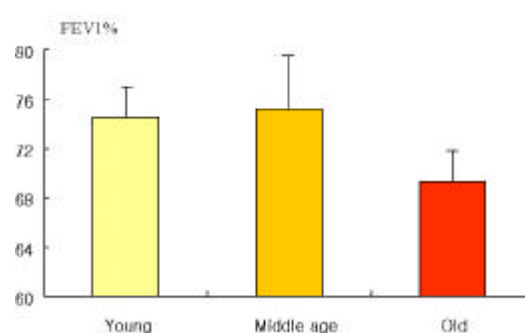


Figure 2. FEV1% at first detection of wheezing in patients grouped by age

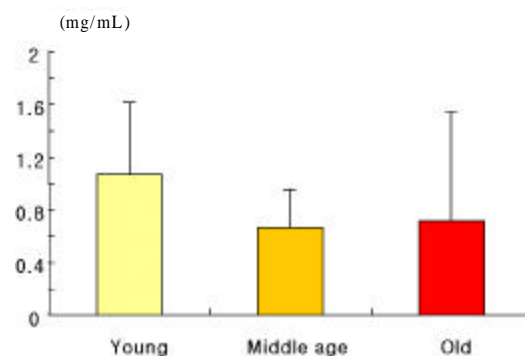


Figure 3. Methacholine concentration at first detection of wheezing in patients grouped by age

DISCUSSION

Asthma in the elderly, being the subject of much concern due to an increase in the aged population, can be characterized by a delay in diagnosis, a difficulty in identifying due to considerable complications with other diseases and poor treatment. The primary reason for these characteristics is that elderly patients cannot perceive their symptoms exactly. This study compared an old-aged group with young and middle-aged groups to confirm whether the decrease in wheezing complaints by the old is attributed to underdevelopment of airway obstruction by stimulation, or lower incidence of audible wheezing based on the airway obstruction even at the similar level, or poor perception of the old regardless of the same rate of wheezing development. To this end, the patients were checked by auscultation for the presence of wheezing during the methacholine inhalation to survey if they can perceive wheezing or not. As a result, the rate of wheezing development was discovered not to be different by age and there were no differences of FEV1 value and methacholine concentration value according to wheezing. It was found, in consequence, that there exist no differences by age in the airway reaction to stimulation and the rate of wheezing development.

In this study, around 87% of positive patients during the methacholine provocation test expressed wheezing development, regardless of age difference. Some former studies reported that, among positive patients under the methacholine provocation test, 48%⁽⁶⁾ and about 75%^(7,8) expressed wheezing, the frequency of which was higher than ours. This difference is due to the fact that this study adopted a tidal breathing method as the method for the methacholine challenge test rather than the intermittent breathing method in other studies and that subjects of this study are all asthmatics rather than only the patients showing the positive findings in the methacholine test being the subjects of other studies. Therefore, there is a difficulty in making a direct comparison between this study and other studies. Even in the non-wheezing group, however, FEV1% fall and FEV1% after inhalation of the final methacholine concentration did not show differences from those in the wheezing group. This means that the presence of wheezing cannot be explained solely with the change of lung functions; it is related to a previous report insisting that air flow limitation plays an important role in developing wheezing and yet a geometrical change accompanying some pressure changes cannot be excluded from the cause of

the development of wheezing^{9,10)}. Therefore, it is considered that other factors will decide the presence of wheezing, in addition to the bronchoconstriction affecting lung volume or pressure, such as functional residual capacity, types of respiration or differences of airway deformity by vital action of abdominal muscle, even though we did not measure additionally.

One of the disputable points in this study may be the observational method of wheezing. First, the presence of wheezing was not objectified. According to the traditional definition of wheezing, it indicates a sound more than 400 mHz over 250 millisecond⁽¹¹⁾ while, as this study adopts a judgment of wheezing by stethoscope only, it may not be accurate. However, it is well known that wheezing can be easily detected by stethoscope and it is almost coincident with the equipment method as to the confirmation of the presence of wheezing⁽⁶⁾. Considering such a fact, these differences in adopted methods are deemed to be a matter of secondary importance. Second, we adopted a deep breath at a normal respiratory speed as the type of respiration in stethoscopy. Such type of respiration was, however, difficult to standardize. Even a healthy person can develop wheezing by forced expiration at the level of a little lung volume⁽¹²⁾. It is accordingly, considered that every patient has a different possibility for the development of wheezing based upon expiratory flow rate and lung volume during stethoscopy. As the use of a stethoscope is a generally accepted way of examination to in deep breathing at a normal respiratory speed and it does not need any special effort, it is believed not to cause any significant difference in comparing and observing the presence of a wheezing.

This study reveals that FEV1 value turned out significantly lower in inverse proportion to the rise of age, indicating that the older a patient concerned is, the lower is basal FEV1. Though every patient did not undergo the survey for morbidity period of asthma, it is assumed that such a period must be long in the case of the old. The resultant airway remodeling⁽¹³⁾ might proceed to provoke irreversible airway obstruction. On the other hand, PC20 value was found not to be different by age, which accords with a report stating that airway response to the methacholine does not decrease in the old⁽¹⁴⁾. The presence of wheezing did not appear differently by age and FEV1% fall and FEV1% at the initial detection of wheezing were not different by age. It indicates that there was no difference in the threshold of a wheezing such as a possibility of developing wheezing, by bronch-

oconstriction at certain degree, as well as in the bronchial hyperactivity among age groups. Nevertheless, the reason for the lower frequency of wheezing in the old is the low perception level of wheezing. It can be analyzed that low frequency of wheezing in respect of the previous history is due to the reduction of the physical ability to perceive wheezing, rather than the reduction of intellectual faculties like memory. A hearing reduction with aging is highly possible as a primary reason for not perceiving a wheezing, even though this study does not cover the tests for hearing or intellectual faculties, including memory.

It is well known that the old are not very well aware of dyspnea¹⁵⁻¹⁶. In case of acute asthmatic attack, this reduced awareness of dyspnea tends to delay treatment and thereby, might develop into a fatal asthmatic attack. However, this thesis suggests that it is requisite for study on a diagnosis of wheezing in the elderly asthmatics to take an effort to figure out the objective changes, including physical examinations and lung function tests, rather than an inquiry into the case history for the presence of wheezing.

In conclusion, wheezing complaints are not well noticed in the elderly asthmatics due to low perception of wheezing compared with younger asthmatics. There were no differences of bronchoconstriction by stimulus or wheezing developed by bronchoconstriction among young, middle-aged and old groups. More efforts should, hence, be made to closely examine the physiologic variations closely in diagnosing the elderly asthmatics, regardless of a prior medical history of wheezing.

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