

Vocal Symptoms and Allergy—A Pilot Study

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Allergic rhinitis and asthma are common among university students. Inhalant allergies have been considered to be a risk factor contributing to voice disorders. The purpose of this pilot study was to determine if students with confirmed respiratory allergies have frequently occurring vocal symptoms. A questionnaire concerning the prevalence of vocal symptoms was distributed to 49 students attending a 3-year allergen immunotherapy program and to 54 students without known allergy. The results indicated that subjects with allergy report significantly more vocal symptoms than subjects without allergy. Allergy should be considered as an underlying factor for vocal symptoms, especially for persons who work in or study for vocally demanding occupations.

Key Words: Inhalant allergy—Vocal symptoms—Immunotherapy.

INTRODUCTION

Inhalant allergies, either chronic or seasonal, are common.¹ A survey exploring the occurrence of allergic rhinitis and asthma among 10,667 first-year Finnish university students aged 18–24 years showed that about 20% of the students had allergic rhinitis and 5% had asthma.² Allergic rhinitis causes irritation in the upper airways and inhalant allergy might be a common cause of chronic rhinitis and laryngitis.^{3–5} According to King et al,⁶ the larynx of allergic patients is often normal. However, allergies may cause excessive mucosa and

edema of the vocal folds.⁵ The mucous is heavier and more tenacious than in persons without allergy and interferes with the mucosal wave in the vocal folds.³ Edema and excessive mucosa on the vocal folds have a negative effect on the voice quality.^{4–6} Additionally, it causes an increased need for throat clearing and coughing.^{1,5}

Inhalant allergies have been seen as a risk factor contributing to voice disorders.^{3,4} The results of a survey by Roy et al⁷ showed that the subjects who had voice disorders reported respiratory allergies significantly more often than those who did not have voice disorders. The results of two questionnaire studies showed an association between chronic rhinitis and vocal symptoms, which might indicate that the symptoms were associated with respiratory allergies.^{8,9}

In surveys, questions about allergies can be interpreted in different ways, especially if they are self-explanatory. It is common that voice patients think that respiratory allergies are a contributing factor to their problems even if they have not been tested for allergies.

In this study, subjects with confirmed respiratory allergies completed a questionnaire concerning

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vocal symptoms. The results were compared to subjects of similar age without known allergies who completed the same questionnaire. The purpose of the study was to explore if subjects with respiratory allergies have frequently occurring vocal symptoms (ie, symptoms occurring weekly or more often) and if they report more vocal symptoms than subjects in a control group.

MATERIALS AND METHODS

The participants were 49 university students (41 female, eight male) attending a 3-year allergen immunotherapy program at the Student Health Service Center in Turku, Finland. They had been tested for pollen allergy with prick tests and the criteria for immunotherapy were severe allergy and/or inadequate response to allergy medication. Fifty-four students (40 female, 14 male) without known allergy served as control group. All participants were studying at the University of Turku. The mean age was 25.45 years ($SD = 4.46$) in the allergy group and 25.31 years ($SD = 5.93$) in the control group. As to age [$t(101) = 0.129$, $P = 0.898$] and gender [$\chi^2(1) = 0.571$, $P = 0.450$], there was no significant difference between the two groups.

All participants filled out a questionnaire concerning vocal symptoms in the past year. The same questionnaire has been used in several studies in Finland.⁸⁻¹¹ The questionnaire followed the guidelines of the Tuohilampi Questionnaire, which is a pool of questions for epidemiological studies that was developed for the Finnish Institute of Occupational Health.¹² Originally, the questionnaire consisted of 16 main groups of questions with numerous, mostly multiple-choice subquestions (in total 80 questions). The questionnaire was designed to provide information about the prevalence of vocal symptoms. Questions about respiratory tract health problems, previous voice problems, hobbies such as singing and sports and time spent in pubs or discotheques were also included. In this study, the questionnaire only included those seven questions that turned out to be the most effective eliciting information about voice disorders in an earlier study.⁸ These were the questions concerning vocal symptoms. The questionnaire has been published as an appendix in a previous article.⁹

The seven symptoms surveyed were *throat clearing or coughing*, *the voice becomes low or hoarse*, *the voice becomes strained or tires*, *voice breaks while talking*, *a sensation of pain or lump in the throat*, *difficulty in being heard*, and *loss of voice*. The participants were requested to report how frequently they had had these symptoms by selecting for each question one of the following alternatives: (1) every day or most days, (2) weekly or most weeks, (3) monthly or most months, (4) less often, (5) only periodic symptoms, and (6) no symptoms. The subjects in the allergy group also answered health-related questions such as the cause and duration of the allergy, occurrence of rhinitis and asthma symptoms, and medication.

The subjects in the allergy group completed the questionnaire at an allergy treatment appointment at the Student Health Care Center, whereas the subjects in the control group completed it when visiting the Health Care Center for a dental check-up or a normal dental treatment.

For statistical testing, the Chi-square test was used. If the expected frequencies in any cell in the contingency table were less than 5 Fisher's Exact Test was used.

RESULTS

In the allergy group, most of the subjects were allergic to multiple agents. The most common allergies were allergies to pollen from trees (birch and/or alder, 84%), grass (84%), and mugwort (45%). Many subjects had suffered from their allergy for a long time, and about half of them reported that they had had allergy for 16 years or more (Table 1).

All 49 subjects in the allergy group had symptoms of chronic rhinitis. Seventeen of them reported symptoms of asthma, of which 12 had

TABLE 1. Duration of Allergy (N = 49)

Years	Number of Subjects	Percentage of Subjects
1-4	4	8
5-10	8	16
11-15	13	27
16-20	24	49

been diagnosed as having asthma and used asthma medication. One of them had been treated with immunotherapy for more than 2 years. To investigate whether the results in the allergy group could be attributed to the asthmatic subjects, we compared the distribution of vocal symptoms as a function of the presence of asthma. The results testing indicated that the proportion of subjects with asthma did not have statistically significantly more vocal symptoms than subjects without asthma (Fisher's exact test, $P = 0.238$, Table 2 for frequencies).

The association of vocal symptoms as a function of subject group was analyzed using the Chi-square test, which revealed a statistically significant association between group and severity of voice symptoms [$\chi^2(2) = 10.709$, $P = 0.005$, Cramer's $V = 0.322$, indicating a moderate effect size; Table 3]. This main effect was due to a significantly more severe voice symptoms in the allergy group (39% of the subjects) compared to control group (11% of the subjects) [$\chi^2(1) = 6.76$, $P = 0.009$, Cramer's $V = 0.52$ indicating a relatively strong effect size]. There were no significant differences in the obtained frequencies in "no symptoms" and "one or two symptoms" classes ($P > 0.1$).

The subjects in the allergy group reported more often all vocal symptoms except for *loss of voice*. In neither of the groups, this symptom was reported occurring weekly or more often. As to the symptoms *throat clearing or coughing*, the *voice becomes strained or tires*, and the *voice becomes low or hoarse*, the difference between the groups was significant (Table 4).

The duration of the immunotherapy seemed to reduce the vocal symptoms. Ten of the subjects

TABLE 2. Number of Subjects Having Vocal Symptoms Weekly or More Often as Reported by the Subjects Who Had Asthma ($N = 12$) and Subjects Without Asthma ($N = 37$)

Number of Symptoms	Subjects Who Had Asthma	Subjects Without Asthma
No symptoms	3	18
One symptom	2	8
Two or more symptoms	7	11

Fisher's exact test, $P = 0.238$.

TABLE 3. Number of Subjects Having Vocal Symptoms Weekly or More Often as Reported by the Subjects in the Allergy Group ($N = 49$) and in the Control Group ($N = 54$)

Number of Symptoms	Allergy Group		Control Group	
	N	%	N	%
No symptoms	21	43	33	61
One symptom	9	18	15	28
Two or more symptoms	19	39	6	11

Main effect: $\chi^2(2) = 10.709$, $P = 0.005$.

who had received immunotherapy for less than 1 year and seven who had received it for 1–2 years reported two or more frequently occurring vocal symptoms, whereas only one subject who had received immunotherapy for more than 2 years reported frequently occurring vocal symptoms (Table 5). Statistical testing using the number of vocal symptoms as the dependent variable showed a main effect of the duration of immunotherapy (Fisher's exact test, $P = 0.051$). Follow-up tests indicated that those subjects ($N = 13$) who had undergone the treatment for more than 2 years reported significantly less symptoms than those who had received immunotherapy less than 1 year

TABLE 4. One-Year Prevalence of Vocal Symptoms Occurring Weekly or More Often as Reported by the Subjects in the Allergy Group ($N = 49$) and in the Control Group ($N = 54$)

Symptom	Allergy Group		Control Group	
	N	%	N	%
Throat clearing or coughing*	18	37	9	17
The voice becomes strained or tires**	13	27	4	7
The voice becomes low or hoarse***	8	16	1	2
Sensation of pain or lump in the throat	8	16	4	7
Difficulty in being heard	8	16	3	6
Voice breaks	8	16	3	6
Loss of voice	0	0	0	0

*Fisher's exact test, $P = 0.026$.

**Fisher's exact test, $P = 0.015$.

***Fisher's exact test, $P = 0.013$.

TABLE 5. Duration of the Immunotherapy Program and Number of Subjects Reporting No Vocal Symptoms, One Symptom, and Two or More Symptoms ($N = 49$)

Duration of the Immunotherapy Program	Number of Subjects		
	No Symptoms	One Symptom	Two or More Symptoms
Less than 1 year	5	2	10
One to 2 years	9	3	7
More than 2 years	7	5	1

Main effect, Fisher's exact test, $P = 0.051$.

($N = 17$, Fisher's exact test, $P = 0.010$). Other comparisons between groups were not significant.

Seven of the 12 subjects who used asthma medication reported two or more frequently occurring symptoms. None of these had been on the immunotherapy program for more than 2 years.

DISCUSSION

The main result of this questionnaire study is that allergic subjects have more frequently occurring vocal symptoms than subjects in a control group being about the same age. Thirty-nine percent of the subjects in the allergy group reported two or more vocal symptoms occurring weekly or more often compared to 11% in the control group. An earlier study using the same questionnaire, but in which all participants underwent an examination performed by a laryngologist, revealed that those who reported two or more frequently occurring vocal symptoms often had visible changes on their vocal folds.¹⁰ The reasons for vocal symptoms in persons with inhalant allergies are multifactorial. The symptoms may be due to rhinitis and laryngitis because of specific allergy, be due to asthma medication or to other associations with allergy or asthma.^{1,3,13} Excess mucous in the larynx causes vocal symptoms by interfering vocal fold vibration and closure of glottis. Patients with allergic rhinitis and/or asthma have increased excretion of mucus running from nose or rising up from the bronchi.^{5,13} In this study, 37% of the subjects in the allergy group reported frequently occurring throat clearing

or coughing which are signs of excess mucus. Cough and frequent throat clearing as such might be factors contributing to voice disorders.⁵ One should note that throat clearing is not only associated with allergy but also with laryngopharyngeal reflux.^{14,15} Of the subjects in the control group, 17% reported frequent throat clearing or coughing. The subjects in this study were not examined by a laryngologist and it is possible that some subjects in both groups had symptoms of reflux. Still, the subjects in the allergy group reported significantly more frequently occurring throat clearing or coughing, suggesting that these symptoms were at least in part caused by allergy. In future studies, the subjects should preferably undergo an examination by a laryngologist to determine the occurrence of reflux.

One potential caveat in our study is that some subjects in the control group might have allergies. The results of a study by Jackson-Menaldi et al.³ showed that subjects who had voice disorders and did not consider themselves as having an allergy were found to be allergic, for example, to house dust. In the current study, the subjects in the control group were not tested for allergies. Accordingly, our suggestion is that in future studies, all participants should be tested for allergies. However, regarding the interpretation of the present results, if we assume that some of the subjects in the control group did have hidden allergies, it would diminish the difference between the allergy group and control group in terms of the number of reported voice symptoms. This supposition in fact strengthens the claim that allergies are associated with the increased number of voice symptoms.

The results of this study also suggest that allergen immunotherapy may reduce vocal symptoms. Only one subject out of 13 who had been on the immunotherapy program for 2 years or more reported two or more frequently occurring vocal symptoms. Additionally, only one subject who had been on the program for more than 2 years used asthma medication. This might be a coincidence and should be further explored in longitudinal studies on larger groups of subjects. Still, the results are in line with those reported by Cohn et al.¹⁶ In their case study, the subject's voice problems and the need to use medication for asthma were almost totally

absent for 23 months after the beginning of the immunotherapy program. It has been suggested that professional voice users who have allergies should be treated with allergen immunotherapy.^{3,16} Such therapy might not only provide permanent relief of the allergy symptoms but it also lacks side effects that might be harmful for the voice.³ Furthermore, immunotherapy treatment might be particularly important for allergic persons who use asthma medication because of the adverse effect of inhaling corticosteroids on voice problems.^{13,17-19}

To our knowledge, there are no longitudinal studies exploring the effects of immunotherapy treatment involving large groups of subjects with inhalant allergy and voice disorders. In this pilot study, no laryngoscopy was performed. The aim was not to investigate whether allergy causes voice disorders but merely to explore the association between respiratory allergy and vocal symptoms. We suggest that persons who suffer from respiratory allergies should be examined for possible voice disorders by a laryngologist. Additionally, appropriate medical care and voice therapy should be provided for those who have voice disorders associated with respiratory allergy. A special attention should be paid to persons who work in our study for vocally demanding occupations.

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