Voice Change in Seasonal Allergic Rhinitis

Eva Millqvist*, Mats Bende*, , , Moa Brynnel*, Inger Johansson*, Sofi Kappel† and Ann-Christine Ohlsson†

†Department of Logopaedics and Phoniatrics, Sahlgrenska University Hospital, Göteborg, Sweden

*Department of Otorhinolaryngology and Allergy Centre, Central Hospital, Skövde, Sweden

Accepted 12 December 2006. Available online 18 May 2007.

Journal of Voice
Volume 22, Issue 4, July 2008, Pages 512-515

Summary

Voice problems are seldom reported in pollen allergy, although the allergic reaction involves the entire airways. The objective of this study was to investigate voice dysfunction during the pollen season in patients with allergic rhinitis. Thirty patients with verified birch pollen allergy and 30 controls were investigated twice, during the pollen season and outside the pollen season. Both times they scored respiratory and voice symptoms, the latter with the validated questionnaire Voice Handicap Index (VHI), and performed standardized voice recordings. These recordings were analyzed in a controlled manner by a professional voice therapist. During the allergy season, patients reported more respiratory and voice symptoms compared with controls. Those with blinded scored voice dysfunction scored their voice quality during springtime as 31 mm (95% confidence interval [CI] 20–42 mm), compared with 13 mm (95% CI 6–21 mm for participants without voice dysfunction ($P < 0.01$). Furthermore, the group with experienced voice dysfunction scored significantly higher on the VHI in the functional and physical domains and in the total VHI score. Although voice problems during the pollen season are rarely discussed, in allergic rhinitis the larynx may also be involved. These findings support that some patients experience voice change, an experience which can be objectively confirmed.

Key Words: Allergic rhinitis; Voice symptoms; Objective vocal assessment

Abbreviations: VAS, visual analog scale; VHI, Voice Handicap Index; CI, confidence interval; IgE, immunoglobulin E

Introduction

Patients presenting to an allergy clinic sometimes report having voice problems during the pollen season but not during the rest of the year. Allergy accompanied by voice problems has been reported among professional voice users with asthma. For qualified singers, even a small dysfunction of the voice may have serious consequences.[1], [2] and [3] A common but seldom discussed problem among patients with asthma who take inhaled corticosteroids is hoarseness.4 Jackson-Menaldi et al investigated patients with voice problems and found that these patients were sensitized to common inhaled allergens.5 However, in their preliminary study they did not find a causal connection. From the clinician's perspective, it would seem that when confronted with a patient who experiences significant voice symptoms in the presence of seasonal allergic rhinitis, it is important to establish whether the voice change can be attributed to the allergic condition. The aim of the present study was to evaluate whether some patients with pollen allergy experience voice changes, what kind of changes they experience, and whether these changes can be objectively confirmed.

Materials and methods

Fifty-one patients (27 women and 24 men) with allergic rhinitis to birch pollen, who had been examined at the Allergy Centre of Skövde Central Hospital during the preceding years, were asked to participate in this study. The study complied with the Declaration of Helsinki and was approved (# 0673-02) by the Ethics Committee of the University of Göteborg, Sweden. The examination of each patient consisted of a medical history, an allergy questionnaire, a skin-prick test (sometimes in combination with analysis of specific immunoglobulin E in serum) and evaluation of clinical status. The skin-prick test comprised the following allergens: birch, hazel, timothy, mugwort, house dust mite

(Dermatophagoides farinae and Dermatophagoides pteronyssinus), horse, cat, dog, and molds (Altenaria, Penicillium, and Cladosporium). Only patients with allergic rhinitis, with the allergic symptoms limited to the birch pollen season, were enrolled in the study. Patients on corticosteroid inhalation therapy or with suspected asthma were excluded.

Thirty of the patients (17 women and 13 men, mean age 40 years) agreed to participate in the study. As controls, 30 healthy subjects, matched by age and gender (mean age 39 years), were recruited among the staff of the hospital and friends. None of the controls was aware of having any pollen allergy. Three patients in the allergy group and four in the control group were smokers. All participants were investigated twice, once during the birch pollen season in mid-May and once during the nonpollen season in October. On both these occasions all of the participants filled in a questionnaire about symptoms in the upper and lower airways. The following questions were asked: Did you have nasal secretions (alternatives: itching, eye irritation, heavy breathing) during the past week? (Answer alternatives: no, a little, moderately, a lot; scored 0–3.) Nasal congestion was graded on a visual analog scale (VAS) of 100-mm length marked a totally open nose to a totally blocked nose. Furthermore, there were two questions about voice quality: How is your general voice quality? (The answer was graded on a VAS from good to bad.) Do you have a hoarse or unclear voice? (This was scored from not at all to very much.)

Patients and controls evaluated any voice dysfunction by means of a validated questionnaire, the Voice Handicap Index (VHI), which has been developed to quantify voice quality.6 This index consists of 30 questions on emotional, functional, and physical aspects of voice quality, with 10 questions in each domain. Each question is graded on a 5-point scale from 0 (never) to 4 (always), a high score indicating worst voice problems. The total score for the three domains ranges from 0 (unaffected) to 120 (severely affected).

On both occasions, the voice of each participant reading a standard text was recorded on tape. The same experienced voice therapist listened to all the paired recordings in a double-blind, randomized fashion and determined whether a voice was impaired in any of the paired recordings. To evaluate the

power of the voice therapist's grading, 10 recordings in the study were randomly chosen and blindly evaluated twice. In total, 70 paired recordings were, therefore, evaluated. The recordings were numbered and compiled on a compact disc by a professional sound technician from the Swedish Radio.

Statistical analysis

Comparisons between the groups were performed with t test, and distribution differences were calculated with the χ2-test. Confidence intervals (95% CIs) are presented within brackets.

Results

The patients reported generally more symptoms than did the controls during the pollen season. The differences in symptom scores between the pollen and the nonpollen season were statistically significant between the groups, as presented in Table 1.

Table1.

The Difference in Symptom Scores Between the Pollen Season and the Nonpollen Season in 30 Patients and 30 Nonallergic Controls

	Patients (n = 30)	**Controls (n = 30)**	***P* Values**
Nasal secretions (score 0–3)	1.0 [0.7 to 1.4]	−0.2 [−0.5 to 0.2]	<0.0001
Nasal itching (score 0–3)	1.0 [0.6 to 1.3]	−0.1 [−0.5 to 0.2]	<0.0001
Eye irritation (score 0–3)	1.4 [1.0 to 1.7]	0.03 [−0.3 to 0.4]	<0.0001
Heavy breathing (score 0–3)	0.6 [0.4 to 0.9]	0 [−0.3 to 0.3]	<0.01
Nasal congestion (VAS 0–	13.0 [4.5 to	−2.3 [−10.8 to	<0.05

	Patients (n = 30)	**Controls (n = 30)**	***P* Values**
100 mm)	21.5]	6.2]	
General voice quality (VAS 0–100 mm)	9.0 [−0.6 to 17.4]	−3.9 [−12.3 to 4.5]	<0.05
Hoarse/unclear voice (VAS 0–100 mm)	14.1 [−5.8 to 22.4]	−4.2 [−12.5 to 4.0]	<0.01

Notes: Data are presented with 95% CIs.

The mean VHI scores is presented in Table 2. The total VHI score at pollen-time varied between 0 and 65 for the patients and between 0 and 12 for the controls. At the nonpollen season, the score varied between 0 and 34, and between 0 and 38 for patients and controls, respectively. Thus, many of the patients did not have a remarkable VHI score during pollen season compared to controls. However, calculation of the VHI difference between the seasons showed that allergic patients reported a significant higher score at springtime in negative functional, physical, and total effect (but not in emotional effect) on their voices compared with healthy controls.

Table 2.

VHI Scores in the Three Domains During the Pollen Season and the Nonpollen Season in 30 Patients with Allergy Compared with 30 Controls

---

VHI Domains	Pollen Season		Nonpollen Season		Difference Between Seasons
	Patients	Controls	Patients	Controls	Patients vs Controls
Emotional	3.5 (6.0)	0.2 (0.8)	2.8 (3.4)	1.0 (3.2)	NS
Functional	4.6 (4.6)	1.1 (1.9)	3.9 (3.6)	2.4 (3.4)	*P* < 0.01
Physical	10.2 (8.0)	1.5 (2.8)	7.2 (6.0)	2.6 (3.4)	*P* < 0.01
Total	18.3 (17.2)	2.8 (5.3)	13.9 (11.3)	6.0 (9.1)	*P* < 0.01

Note: Scores are presented as mean ± SD.

Power estimations showed that the voice therapist made the same judgment of both recordings for 90% of participants. She graded the spring recording worse than the autumn recording for 18 participants, 12 patients, and 6 controls. The difference in distribution between patients and controls was not statistically significant (P = 0.09). Those with disproved voice change during springtime scored higher for the registered symptoms than the others, but without statistical significance. By contrast, the mean VAS score for voice quality was 31 mm (95% CI 20–42 mm) for the patients with blinded estimated voice dysfunction, compared with 13 mm (95% CI 6–21 mm) for participants without voice dysfunction (P < 0.01). Furthermore, during springtime the group with voice dysfunction, according to the voice therapist, scored significantly higher on the VHI in the functional and physical domains and in the total VHI score (Table 3).

Table 3.

The Individuals Assessment of the Voice During Springtime Using the VHI in Relation to the Voice Therapist's Judgment

VHI Domains	With Voice Dysfunction	Without Voice Dysfunction
Emotional	3.1 (1.1)†	1.3 (0.7)
Functional	4.7 (0.9)*	2.1 (0.8)
Physical	9.5 (1.7)**	4.3 (1.1)
Total score	17.2 (3.4)*	7.7 (2.2)

Note: Scores are presented as mean ± SEM.

*P < 0.05; **P < 0.01; †not significant for differences between groups.

Discussion

According to the Swedish Meteorological and Hydrological Institute, pollen definitely was present in the environment during the studied time period, although it was not a heavy pollen season.

The VHI has mainly been used in groups of patients with defined diseases or in patients referred to special centers for voice problems.[6], [7], [8] and [9] The patients in the present study seemed to have much fewer problems than those previously described. Nevertheless, the assessment showed statistically significant differences in VHI between allergic patients and controls, and between the blinded scored voice dysfunction and VHI. This study emphasizes the importance of an objective method for analysis of allergy-related voice dysfunction, although there was a clear statistical relationship between subjective and the voice therapist's perceptions of voice quality. However, more data are necessary to prove that the observed voice changes during pollen season are really caused by an allergic reaction.

If voice problems due to allergic reactions would be of great importance, such problems would have triggered more discussion and reports in the literature than seen up to now. Nevertheless, the results of this study are useful in a

clinical situation when explaining symptoms to the patient. This study raises new questions about seasonal, allergy-related voice dysfunction. Firstly, is there a relationship between the degree of voice dysfunction and the severity of allergy symptoms? To answer this question, patients who also have symptoms in the lower airways should be included, possibly in a new study. Secondly, what causes voice dysfunction? A possible cause is a vocal edema and therefore investigating such patients with videostroboscopy would be highly advantageous. Thirdly, is voice dysfunction related to an allergic reaction or is it merely an effect of pollution, which would be seen in sensitive individuals? We suggest an additional case-control study to address these questions.

In the present study, we objectively confirmed the experience of voice changes in allergic rhinitis due to birch pollen. It is supposed that these patients with pollen allergy in the upper airways as healthy as others outside the pollen season and therefore it is assumed that other factors with possible effect on the voice should be equally distributed between the patients and the controls. These changes were found in the physical and functional domains, manifested by hoarseness and an unclear voice. The voice changes were fairly mild, which explains the fact that very little attention has been paid to this symptom.

Acknowledgments

The authors are grateful to Christel Larsson for skillful technical assistance.

References

1 R.I. Williams, Allergic laryngitis, Ann Otol Rhinol Laryngol 81 (1972), pp. 558–565. View Record in Scopus | Cited By in Scopus (11)

2 J.R. Cohn, J.R. Spiegel and R.T. Sataloff, Vocal disorders and the professional voice user: the allergist's role, Ann Allergy Asthma Immunol 74 (1995), pp. 363–375.

3 J.R. Cohn, R.T. Sataloff and C. Branton, Response of asthma-related voice dysfunction to allergen immunotherapy: a case report of confirmation by

methacholine challenge, J Voice 15 (2001), pp. 558–560. Article | PDF (23 K) | View Record in Scopus | Cited By in Scopus (5)

4 I.J. Williamson, S.P. Matusiewicz, P.H. Brown, P.A. Greening and G.K. Crompton, Frequency of voice problems and cough in patients using pressurized aerosol inhaled steroid preparations, Eur Respir J 8 (1995), pp. 590–592. View Record in Scopus | Cited By in Scopus (69)

5 C.A. Jackson-Menaldi, A.I. Dzul and R.W. Holland, Allergies and vocal fold edema: a preliminary report, J Voice 13 (1999), pp. 113–122. Abstract | PDF (2515 K) | View Record in Scopus | Cited By in Scopus (14)

6 B.H. Jacobsen, A. Johnson, C. Grywalski, G. Silbergleit, M.S. Benninger and C.W. Newman, The voice handicap index (VHI): development and validation, Am J Speech Lang Pathol 6 (1997), pp. 66–70.

7 M.W. Hsiung, P. Lu, B.H. Kang and H.W. Wang, Measurement and validation of the voice handicap index in voice-disordered patients in Taiwan, J Laryngol Otol 117 (2003), pp. 478–481. View Record in Scopus | Cited By in Scopus (14)

8 J.M. Wingate, B.H. Ruddy and D.S. Lundy et al., Voice handicap index results for older patients with adductor spasmodic dysphonia, J Voice 19 (2005), pp. 124–131. Article | PDF (82 K) | View Record in Scopus | Cited By in Scopus (7)

9 T. Kandogan and A. Sanal, Quality of life, functional outcome, and voice handicap index in partial laryngectomy patients for early glottic cancer, BMC Ear Nose Throat Disord 5 (2005), pp. 1–7.

Address correspondence and reprint requests to Mats Bende, Department of Otorhinolaryngology, Central Hospital, SE-541 85 Skövde, Sweden.