Prevalence of Self-Reported Dysphonia and Dysphagia in Patients with Allergy

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Summary: Objective. To investigate the prevalence of self-reported dysphonia and dysphagia in patients with positive allergy test in comparison to patients with negative allergy tests.

Subjects and Methods. A total of 52 patients who presented to the allergy clinic of a tertiary medical referral center for skin testing between June 2019 and December 2019 were were recruited for this study. Demographic data included age, gender, history of smoking, family history for eczema, atopy, asthma, food and drug allergy. A control group of 20 subjects was matched according to age and gender. All subjects were asked to fill the voice handicap index -10 and the eating assessment tool (EAT-10) questionnaires.

Results. Thirty-six of 52 patients were positive for at least one allergen, and 23 tested positive for at least three allergens. On the other hand, there was no significant difference in the mean score of VHI-10 in patients with allergy to at least one allergen, in comparison to patients with no allergy (3.667 vs 3.066, respectively, P value 0.307). Similarly, there was no significant difference in the mean score of EAT-10 between the two groups (0.305 vs 0.00, respectively, P value 0.270). There was also no significant difference in the mean score of VHI-10 in patients with allergy to at least three allergens in comparison to patients with no allergy (3.304 vs 3.066, respectively, P-value 0.603). Similarly, there was no significant difference in the mean score of EAT-10 between the two groups (0.435 vs 0.00, respectively, P-value 0.667). There was a significant difference in mean VHI-10 scores between patients testing positive for at least one allergen and the control group (P = 0.0002).

Conclusion. The results of this investigation did not show any significance in the prevalence of self-reported dysphonia and dysphagia in patients with positive allergy skin testing in comparison to those with negative allergy skin-testing. More clinical studies on the prevalence of self-reported phonatory complaints in patients with allergy are warranted.

Key Words: Dysphonia— Dysphagia—Allergy—Voice.

INTRODUCTION

Allergy is a common condition in otolaryngology practice. More than 50% of the United States population test positive to at least one allergen, and about 20% suffer from an allergic condition.[1] Predisposing factors include poor working environment conditions, exposure to allergens, and pre-existing diseases such as asthma and atopy. The presenting symptoms are many among which are nasal congestion, nasal discharge, cough, wheezing, throat clearing, globus, and change in voice quality.[2,3]

Numerous studies support the association between allergy and dysphonia. Allergy is described as a main culprit particularly in patients with no structural or neurologic laryngeal disorders. The prevalence of dysphonia in patients with allergy varies markedly in the literature, with no clear consensus. The disparity in the reported rates is ascribed to the diversity in study groups, study designs, and use of different diagnostic methods.[4−7] The purpose of this investigation is to cast more information on the association between allergy and dysphonia by examining the prevalence of self-reported dysphonia in patients with positive allergy skin test vs patients with negative allergy skin test.

Given the unified airway concept, the hypothesis set forth is that patients with positive allergy skin-test are at a higher risk of having self-reported dysphonia in comparison to patients with negative allergy skin test. The outcome measure used in this study is the Voice Handicap Index-10 (VHI-10). The prevalence of self-reported dysphagia using the Eating Assessment Tool-10 (EAT-10) is also reported in view of the anatomic link between the larynx and pharynx, and their common neuromuscular innervation.

SUBJECTS AND METHODS

After having read and signed the informed consent approved by the Institution review board (IRB), patients who presented to the allergy clinic of a tertiary medical referral center for skin testing between June 2019 and December 2019 were invited to participate in this study. Patients on medications for rhinitis and/ or reflux disease at the time of investigation were excluded from the study. Similarly, patients with a recent history of upper respiratory tract infection, history of laryngeal manipulation or surgery, and central or peripheral neurologic disorder causing throat symptoms or vocal changes were excluded. Demographic data included age, gender, history of smoking, family history for eczema, atopy, asthma, food and drug allergy. Allergy skin testing was conducted to check for allergic reactions to common allergens which included trees (ash,

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cypress, olive tree, eastern oak, privet, birch mix, pine mix), grasses (bermuda, timothy, ryegrass, 7 grass mix), weeds (chenopodium, russian thistle, ragweed and weed mix), mold mix, household inhalants (D. Farinae and D. pteronyssinus) and pet allergens (cat and dog). The tests were done on the back of participants (the allergens tested were provided from DIATER Laboratories). In parallel with the study group, a total of 20 subjects with no history of dysphonia or allergy (eczema, urticarial, food or drug allergy) and matched according to age and gender were recruited as a control group.

All subjects, study group and controls, were asked to fill out the VHI-10 by Rosen et al[8] and the EAT-10 questionnaire by Belafsky et al.[9]

Statistical analysis

Means (±standard deviation) and frequencies were calculated to describe continuous and categorical variables, respectively. Mann-Whitney U test was used to compare the means of the continuous variables between patients with allergy and patients without. Data was analyzed using SPSS version 24. (SPSS Inc, Chicago, IL).

RESULTS

Demographic data

A total of 72 patients were recruited for this study. In the study group which consisted of 52 patients, the male to female ratio was 1:1. Thirty-nine percent of the participants were smokers and 55% had a positive history of alcohol consumption. Patient's history was positive for eczema or urticaria, asthma and food/drug allergy in 45%, 20%, and 16% of the cases, respectively. There were no statistical differences in smoking (P = 0.37), alcohol consumption (P = 0.69) and BMI between the control and study group (Table 1).

TABLE 2.
Number of Patients (N) Testing Positive for Each of the Tested Allergens

Positive Skin Test For:	N
Trees	14
Grasses	10
Weeds	7
Molds	4
Household inhalants	30
Pets	17

Allergy skin testing results

Thirty six of 52 patients were positive for at least one allergen and hence were diagnosed with allergy. Of the 36 patients with positive skin testing to at least one allergen, 14 (39%) tested positive for trees, 10 (28%) for Grasses, 7 (19%) for Weeds, 4 (11%) for Molds, 30 (83%) for in house inhalants and 17 (47%) for pets. Of the allergic patients (n = 36), 23 tested positive for at least three allergens (Table 2).

Prevalence of dysphonia and dysphagia in the study group

Only one patient had a VHI-10 above 11 in the group of patients allergic to at least one allergen, and in the group of patients who were non-allergic. Notably the highest mean score of VHI-10 (4.6) was in patients with allergy to grasses, followed by household inhalants (3.57). There was no significant difference in the mean score of VHI-10 in patients with allergy to at least one allergen in comparison to patients with no allergy (3.667 vs 3.066, respectively, P-value 0.307). Similarly, there was no significant difference in the mean score of EAT-10 between the two groups (0.305 vs 0.00, respectively, P-value 0.270).

A sub-category analysis was also performed comparing the mean scores of VHI-10 and EAT-10 in patients testing

TABLE 1.
Demographics Information

Category	Study Group N (% of Study Group)	Control Group N (% of Controls)	P-Value
Sex			
Male	26 (50%)	10 (50%)	1
Female	26 (50%)	10 (50%)	1
Mean age	34.5 ± 11.4	34.6 ± 11.2	0.96
Smokers	20 (39%)	5 (25%)	0.37
Alcohol consumption	28 (55%)	12 (60%)	0.69
Body mass iondex (BMI)			
BMI < 25	34 (67%)	13 (65%)	0.98
BMI > 25	17 (33%)	7 (35%)	0.85
Personal history of eczema/urticaria	23 (45%)	0 (0%)	NA
Personal history of food allergy	8 (16%)	0 (0%)	NA
Personal history of drug allergy	8 (16%)	0 (0%)	NA

TABLE 3.
Mean Voice Handicap Index (VHI-10) and EAT 10 in Patients Allergic to at Least One, and at Least Three Allergens and Patients Who Are Not Allergic

	Allergic to at least One Allergen	Nonallergic	*P*-Value	Allergic to at least Three Allergens	Nonallergic	*P*-Value
VHI-10	3.667	3.066	0.307	3.304	3.066	0.603
EAT-10	0.305	0	0.270	0.435	0	0.667

positive for at least three allergens compared to non-allergic patients.

Also, there was no significant difference in the mean score of VHI-10 in patients with allergy to at least three allergens in comparison to patients with no allergy (3.304 vs 3.066, respectively, *P*-value 0.603). Similarly, there was no significant difference in the mean score of EAT-10 between the two groups (0.435 vs 0.0, respectively, *P*-value 0.667) (Table 3).

Prevalence of dysphonia and dysphagia in the control group

The mean VHI-10 score and EAT-10 score in the control group were 0.3 and 0.05, respectively. There was a significant difference in mean VHI-10 scores between patients testing positive for at least one allergen and the control group (*P*= 0.0002).On the other hand, there was no significant difference in mean VHI-10 scores between patients with negative allergy skin test and the control group (*P* = 0.756). There was no statistical significance in EAT-10 scores between patients testing positive for at least one allergen and the control group (*P*= 0.439).

DISCUSSION

Allergy affects many systems in the body including the phonatory system. The impact of allergy on voice is a subject of thorough debate in the literature. Koc et al investigated the prevalence of vocal dysfunction in 30 patients with allergic rhinitis and reported a higher VHI score and s/z ratio in the study group in comparison to the control group.[10] Similarly, Simberg et al investigated the prevalence of voice symptoms using a questionnaire in 49 patients with confirmed respiratory allergy undergoing immunotherapy, in comparison to 54 subjects with no allergy. The authors found a higher prevalence in the former group, and emphasized the etiologic role of allergy in patients with voice symptoms, particularly in professional voice users.[3] Randhawa et al investigated voice symptoms and their impact on quality of life using the VHI questionnaire in 70 patients (consecutive) who presented to the rhinology clinic for skin testing. The mean VHI score in patients with positive testing for 4 or more allergens was higher than that in patients with no allergy (23.7 vs 7.8, respectively). The authors concluded that vocal dysfunction is often underdiagnosed in patients with allergy and that the VHI score can be used to discriminate between those with allergy and those without allergy.[11] Millqvist et al studied vocal dysfunction in 30 patients with pollen allergy vs 30 controls. Both groups were tested using the VHI during and outside the pollen season. The results indicated higher prevalence of vocal and respiratory symptoms in patients with allergy during the pollen season[5]. Similarly, Turley et al reported a higher prevalence of vocal symptoms in patients with allergic and non-allergic rhinitis (32.8% and 26.9%, respectively), in comparison to a control group (8.1%). The study was conducted on 250 patients using the Voice-Related Quality of life questionnaire among other validated questionnaires.[12]

Our results are not in partial agreement with the above reports. There was a significant difference in mean VHI-10 scores between patients testing positive for at least one allergen and the control group (*P*= 0.0002). Allergy-induced dysphonia has been attributed to several mechanisms, most important of which is nasal dysfunction and trafficking of mucus postnasally.[15,16,17] Nasal dysfunction in patients with allergy can predispose to mouth breathing and dehydration of the vocal folds. This latter has an adverse effect on the phonatory threshold pressure (PTP), leading to vocal fatigue and increase in phonatroy effort.[18–21] Trafficking of the excess mucus post-nasally can also interfere with vocal fold vibration resulting in an increase in voice jitteriness and cycle-to-cycle variation in intensity. Of equal importance to these deterring mechanical factors are allergy-induced behavioral patterns, namely cough and throat clearing. These behavioral patterns are phono traumatic and may lead to vocal fold structural changes.[22] Another cause for vocal fold dysfunction in patients with allergy is local inflammatory laryngeal reaction. Belafsky et al reported an increase in mucosal eosinophilic count following exposure to house mite allergens.[23] Similarly, Ansaranta et al showed that mucosal edema and erythema following exposure to histamine challenge.[24]

What is noticeable in this study is the non-significant difference in the mean VHI-10 score in patients with positive allergy skin testing in comparison to patients with negative skin allergy testing. Similarly, there was no significant difference in the mean score of EAT-10 between patients with allergy vs patients with no allergy. Given that the pharynx and larynx share common neuromuscular innervation, it is reasonable to speculate the similarity in prevalence of self-reported dysphonia and dysphagia between the two groups. This is in agreement with numerous reports highlighting the high prevalence of globus sensation and dysphagia in patients with muscle tension dysphonia and patients with functional voice disorders.[13,14] The lack of significant difference in the prevalence of dysphonia and dysphagia in patients with positive skin allergy testing in comparison to patients with negative skin allergy testing can be attributed to the small sample size, which could have precluded statistically significant results. Another possible explanation is the high threshold of self-perceived voice and swallowing complaints of our study group. This view is supported by the relatively low scores of both VHI-10 and EAT-10 in patients with and without allergy.

This study has two main limitations: One is the sample size and second is the lack of objective voice measures, such as acoustic and/or aerodynamic variables, and the lack of laryngeal examination on the whole sample size.

CONCLUSION

The association between allergy and dysphonia needs further investigation. Although the results of this investigation did not show any significance in the prevalence of self-reported dysphonia and dysphagia in patients with positive allergy skin testing in comparison to those with negative allergy skin-testing, more clinical studies on the prevalence of self-reported phonatory complaints in patients with allergy are warranted.

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