



# Prevalence of Laryngeal and Pharyngeal Symptoms in Patients with Environmental Allergy

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## ABSTRACT

**Background:** The effect of environmental allergy on laryngeal and pharyngeal complaints is not well understood. The goal of this study was to determine the prevalence of laryngeal and pharyngeal symptoms in patients with environmental inhalant allergy.

**Methods:** A retrospective review was conducted of all patients undergoing allergy skin testing between 2006 and 2009. Patients with positive skin tests were included and were classified as 'mild' or 'extensive' reactors based on skin testing results. Data regarding laryngeal and pharyngeal complaints, as well as ocular and nasal symptoms, had been systematically documented for all patients. The prevalence of these complaints was calculated in each group of reactors and overall.

**Results:** The prevalence of laryngeal and pharyngeal complaints was 42.0% overall, 45.5% among the mild reactors, and 39.3% in the extensive reactors. No patients complained of hoarseness or were felt to have dysphonia. There was no statistically significant difference between the mild and extensive reactors ( $p = 0.78$ ). The prevalence of ocular and/or nasal symptoms was 96.0, 90.9 and 100%, respectively.

**Conclusion:** The prevalence of laryngeal and pharyngeal complaints in allergy sufferers was low in this study. Given the conflicting literature on this topic, there is insufficient evidence to establish a causal link between environmental allergy and laryngeal and pharyngeal symptoms.

**Keywords:** Allergy, Dysphonia, Environmental, Allergy testing.

**How to cite this article:** Shah MD, Wise SK, Rotella MR, Ingley AP, Johns MM. Prevalence of Laryngeal and Pharyngeal Symptoms in Patients with Environmental Allergy. *Int J Phonosurg Laryngol* 2014;4(1):1-4.

**Source of support:** Nil

**Conflict of interest:** None

## BACKGROUND

Inhalant allergies, both seasonal and perennial, are quite common, affecting 10 to 25% of the population.<sup>1,2</sup> The most

common presenting symptoms of environmental allergies include nasal congestion, rhinorrhea, sneezing, itchy and watery eyes, and aural fullness secondary to inflammation of the mucous membranes of the nose, eyes, eustachian tubes, middle ear, sinuses and pharynx.<sup>3,4</sup> Allergies have also been strongly associated with otitis media, rhinosinusitis, asthma and several other chronic medical conditions.<sup>3,4</sup> While allergies are generally not a life-threatening condition, they can significantly impair quality of life and complications can occur.<sup>5,6</sup> The economic impact of allergies is also significant, with the total direct and indirect cost of allergic rhinitis estimated at approximately \$5.3 billion per year.<sup>7</sup>

The nasal, ocular, and pulmonary effects of environmental allergies have been well described; however, the prevalence of laryngeal and pharyngeal effects is not well understood. Some have found that patients with voice disorders more commonly report respiratory allergies when compared to patients without voice complaints<sup>8</sup> and others have reported allergy-related voice problems among professional voice users.<sup>9</sup> While some authors believe that laryngeal complaints can result from 'allergic laryngitis,' others believe that the laryngeal symptoms associated with allergic rhinitis are an extension of an allergy in the upper airway, as opposed to a distinct pathological process in the larynx itself. The goal of this study was to determine the prevalence of laryngeal and pharyngeal complaints in patients with environmental inhalant allergy.

## METHODS

The medical records of all patients undergoing allergy skin testing in the Emory University Department of Otolaryngology—Head and Neck Surgery from November 2006 to October 2009 were retrospectively reviewed. The study was approved the Emory University Institutional Review Board. Demographic data, including gender and age were recorded. Patients underwent allergy testing after failure of conservative treatment such as environmental controls and pharmacotherapy. All patients were tested using the modified quantitative testing (MQT) method.<sup>10</sup> This method involved blending of the skin prick and intradermal testing protocols. Patients were divided into groups based on the number of antigens for which they tested positive. A positive test

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was defined as a class 3 reaction or higher and no further distinction was made based on level of reaction. Those with positive tests for five or fewer antigens were placed in the ‘mild reactors’ group, while those with positive tests for 11 or more antigens were classified as ‘extensive reactors’. All patients in the extensive reactor group were eventually enrolled in immunotherapy. Patients with 6 to 10 positive tests were excluded.

The initial consultation for each patient was reviewed for complaints of laryngeal and pharyngeal symptoms. Laryngeal and pharyngeal symptoms included hoarseness, cough, sore or itchy throat, postnasal drip, increased mucus or phlegm in the throat and throat clearing. Patients were routinely asked about each of these symptoms with positive and negative responses recorded in the medical chart. The presence of dysphonia, as described by the evaluating physician at the initial evaluation, was also noted. The prevalence of pharyngeal and laryngeal complaints in the mild and extensive allergy test reactor groups was compared. All statistical testing was performed using Stata v8.2 (Stata Corp Inc., College Station, Texas, USA). Groups were compared using the Chi-square test with a significant level of  $p < 0.05$ .

## RESULTS

Fifty patients met inclusion criteria-22 patients in the ‘mild reactor’ group and 28 patients in the ‘extensive reactor’ group. The mean age was 40.1 years in the mild reactor group and 37.7 years in the extensive reactor group. Males comprised 27.3% (6/22) of the mild reactor group and 35.7% (10/28) of the extensive reactor group.

The prevalence of nasal and/or ocular symptoms in the mild reactor group was 90.9% (20/22) compared to 100% (28/28) for the extensive reactor groups (Table 1). Symptoms included rhinorrhea, nasal airway obstruction, sneezing, ocular itching or watering and headaches. Laryngeal and pharyngeal symptoms included sore or itchy throat, cough, postnasal drip, increased mucus or phlegm in the throat and throat clearing. These symptoms were present in 45.5% (10/22) of the mild reactors and 39.3% (11/28) of the extensive reactors (*see* Table 1). Cough was the most prevalent pharyngeal complaint, present in 20% of patients. There was no statistical difference ( $p = 0.78$ ) with regards to

pharyngeal and laryngeal symptoms between the two groups. No patients complained of hoarseness and none were noted to have dysphonia on their initial consultation.

## DISCUSSION

The concept of ‘allergic laryngitis’ was introduced in the otolaryngology literature more than 30 years ago and has generated significant controversy. Some postulate that increased vocal fold edema and mucus production result in vocal symptoms such as cough, hoarseness and vocal effort. In support of this hypothesis, several studies have found a relationship between allergy and laryngeal symptoms. To the contrary, however, human vocal folds appear to be less affected by allergic reactions due to the paucity of mast cells, which are more prominent in the supraglottic and subglottic regions of the adult larynx<sup>11</sup> and our study has found that laryngeal and pharyngeal symptoms are uncommon in patients with allergy.

Krouse et al<sup>12</sup> found that allergic patients report more voice-related symptoms than non-allergic patients. However, there were no abnormalities identified on laryngeal videostroboscopy or acoustic and aerodynamic voice analysis. Furthermore, these patients were only tested for allergy to a single antigen.<sup>12</sup>

Jackson-Menaldi et al<sup>13</sup> investigated allergies in patients with voice complaints. They enrolled 17 subjects with dysphonia and evaluated them for allergy. All subjects had laryngeal edema on stroboscopic examination, and 15/17 patients had positive allergy testing on an allergy screen, leading the authors to conclude that edema of the vocal folds is the ‘hallmark of allergic laryngitis’. However, all subjects were identified as having evidence of vocal abuse and misuse in their voice assessment.<sup>13</sup> Additionally, all of the patients had stroboscopic findings consistent with laryngopharyngeal reflux (LPR), but only two patients were evaluated by a gastroenterologist.<sup>13</sup> The authors even go so far as to state that it is very difficult to distinguish between LPR and ‘allergic laryngitis’ on stroboscopic examination.<sup>13</sup> Vocal fold edema is a nonspecific laryngeal finding and various conditions can be responsible for this mucosal manifestation.

In Japan, the number of patients with allergy to Japanese cedar pollen (*Cryptomeria japonica*) has been steadily increasing. Naito et al<sup>14</sup> found that 40 to 70% of patients with Japanese cedar pollinosis had laryngeal symptoms that occurred in parallel with seasonal increases in pollen counts. They also found increased eosinophilia in the laryngeal mucosa of rats sensitized to Japanese cedar pollen compared to the controls.<sup>14</sup> However, the clinical significance of laryngeal mucosal eosinophilia is uncertain.

Reidy et al<sup>15</sup> conducted a randomized blinded trial to examine the laryngeal effects of antigenic stimulation to a

**Table 1:** Patients-reported symptoms categorized by reaction on allergy testing

	Ocular and/or nasal symptoms	Pharyngeal/laryngeal symptoms
Mild reactors	20/22 (90.9%)	10/22 (45.5%)
Extensive reactors	28/28 (100%)	11/28 (39.3%)
Overall	48/50 (96%)	21/50 (42.0%)

dust mite antigen in subjects with a positive skin-prick test for the antigen. Subjects were exposed to nebulized antigen or a placebo and were assessed with a variety of measures both pre- and postexposure. The antigen-exposed group did have increased endolaryngeal mucus compared to the placebo group. However, there were no differences noted between the groups in terms of voice handicap index (VHI) scores, stroboscopic examination of the larynx, or acoustic and aerodynamic assessment of voice.<sup>15</sup>

The same group of authors<sup>16</sup> attempted to investigate this issue further with another randomized blinded trial, this time with two different concentrations of nebulized dust mite allergen and placebo. The study was terminated prematurely as the first two subjects in the allergen exposure group experienced severe adverse pulmonary reactions after exposure to the high concentration antigen. One subject received the placebo exposure and did not experience any pulmonary or vocal difficulties. Both of the allergen exposed subjects experienced chest tightness, coughing, and subjective vocal difficulties after the high (1:40 weight/volume) concentration challenge. The first test patient had no change in acoustic or speech aerodynamic analysis after antigen challenge. The other test patient had normal acoustic analysis after challenge, but did have altered aerodynamics related to phonation time.<sup>16</sup> This may have been attributable to a greater than 50% decrease in FEV<sub>1</sub>. Both patients had mild supraglottic and glottic edema and erythema as well as more abundant and viscous endolaryngeal secretions on laryngeal videostroboscopy; however, the control patient also had increased laryngeal secretions. The authors suggest that these results support the hypothesis that inhaled allergies can result in 'allergic laryngitis'.<sup>16</sup> However, the study findings have several limitations. It is uncertain if the concentrations of allergen administered in the study are actually present in the environment. Furthermore, it is unclear whether the increased mucus production originated in the larynx or if it was expectorated from the lower respiratory tract or the result of postnasal drip of nasal secretions. Additionally, mucosal edema may be due to throat clearing and coughing triggered by the secretions as opposed to a direct allergen mediated inflammatory effect on the larynx. The study findings cannot be definitively attributable to allergic inflammation.

Hamdan et al<sup>17</sup> reported that singers have a high rate of allergic rhinitis and concluded that respiratory allergies may affect the voice. They reported the incidence of allergic rhinitis to be 87% in singers, more than double the rate reported in the literature for the general population. They also reported that singers with vocal complaints were more likely to have allergic rhinitis compared to singers without vocal complaints. However, the presence of allergic rhinitis

was determined only by a validated questionnaire; no formal allergy testing was performed. In this case, it is difficult to determine if the vocal symptoms are directly related to an allergic effect on the larynx or as a result of nasal airway obstruction and increased mucus production. Also, it is difficult to generalize these findings from a select group of singers to the population at large.

Roy et al<sup>8</sup> evaluated the prevalence of voice disorders in teachers compared to the general population. They found statistically significant higher rates of allergy in teachers and that respiratory allergies were more common in patients with voice disorders. Based on this data, they reported that the frequency of voice disorders was significantly higher in those who experienced respiratory allergies. However, the major weakness of this study is that allergy was determined only by self-reporting.

Randhawa et al<sup>18</sup> propose that clinicians over-diagnose LPR as a cause of dysphonia and that unrecognized 'allergic laryngitis' is responsible for voice complaints in many cases. They based this conclusion on an evaluation of 15 patients with dysphonia, in which 20% were found to have LPR and 67% positive allergy testing. However, LPR was diagnosed based upon the reflux symptom index (RSI) and the reflux finding score (RFS), not more objective measures such as 24 hours pH probe testing. The same group of authors conducted a prospective study of patients presenting for allergy testing with no vocal complaints.<sup>19</sup> They found that VHI scores were higher in allergic patients when compared to non-allergic patients. However, the VHI scores were quite low when compared to other studies of patients with vocal complaints,<sup>20</sup> suggesting that the degree of voice handicap was small. Furthermore, the difference between the allergic and non-allergic groups was minimal and below what is considered clinically significant for VHI scores.<sup>21</sup> Finally, these patients were not evaluated to determine if their vocal symptoms had an identifiable etiology as opposed to assuming probable inflammation due to 'allergic laryngitis.'

Our study has found that in patients who present for allergy testing, there was a low prevalence of laryngeal and pharyngeal complaints. Furthermore, none of the patients reported hoarseness as a symptom and none were felt to have dysphonia by the treating physician. Moreover, there was no difference in symptoms between patients with extensively positive allergy testing and those with mild reaction. Our study is, however, limited by its retrospective nature and the lack of an appropriately chosen group of non-allergic patients for comparison.

A number of studies have found an association between allergy and vocal complaints, which is not surprising given the high prevalence of both allergy and voice complaints

in the general population. There is no clear evidence to establish a causal relationship between allergy and laryngeal symptoms or to support the existence of the diagnosis of 'allergic laryngitis.' As the above discussion illustrates, the existing literature has inconsistent findings and is plagued by methodological issues, which makes it difficult to draw any meaningful conclusions. To definitively evaluate the potential relationship between allergy and the larynx, prospective studies using validated subjective and objective measures of voice impairment are necessary.

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