

# Hypothyroidism and Dysphonia

Kristin Kucera Marcum, MD, S. Carter Wright Jr., MD, Catherine Rees Lintzenich, MD

Department of Otolaryngology, Center for Voice and Swallowing Disorders



## Abstract

**Objectives:** Evaluating thyroid stimulating hormone levels has long been advocated in the work-up of voice disorders, and is routinely performed as part of the standard of care in the Center for Voice and Swallowing Disorders. Overt hypothyroidism in the general population is 0.3%, but little data exists on thyroid function levels in dysphonic patients. The prevalence of undiagnosed thyroid disease in patients with dysphonia is yet to be determined. We investigated whether the prevalence of hypothyroidism in this group differs significantly from the general public.

**Study Design:** Prospective study with retrospective chart review

**Methods:** 951 healthy adults presented to the Wake Forest Voice Center with a chief complaint of dysphonia or hoarseness. 154 patients met criteria for the study. Data collection included Voice Handicap Index (VHI), age, sex, and thyroid stimulating hormone level (TSH).

**Results:** The average TSH obtained from all subjects was 1.97 mIU/L (normal TSH 0.4-5.5mIU/L). In the subject pool from CVSD 2.6% of patients with a chief complaint of dysphonia were found to have an abnormally high TSH.

**Conclusions:** Our results suggest that hypothyroidism is more prevalent in patients with dysphonia than in the general population without dysphonia. In these patients with no obvious physical exam finding to explain dysphonia, or with findings of myxedema, a thorough exam and clinical workup for thyroid disorders remains an important part of the evaluation.

## Introduction

The association between hypothyroidism and dysphonia has been recognized since at least 1960.<sup>1</sup> In animal models with induced hypothyroidism, an increased level of acid mucopolysaccharides in the vocal fold submucosa has been observed.<sup>2</sup> Although these findings have not been reproduced in human cadaver studies, in myxedema the vocal folds become edematous and demonstrate Reinke’s edema (polypoid degeneration). Indeed, the rate of hypothyroidism is higher in patients with Reinke’s edema than in the general population.<sup>3</sup> In milder cases of hypothyroidism, vocal fold changes are less striking. The laryngeal examination can be essentially normal in the hypothyroid patient, despite subjective dysphonia.<sup>4</sup>

Evaluating thyroid stimulated hormone levels has long been advocated in the work-up of voice disorders and is routinely performed as part of the standard of care in the Center for Voice and Swallowing Disorders (CVSD). To date, there are no studies looking at the rate of hypothyroidism in a large group of dysphonic patients. Overt hypothyroidism in the general population is 0.3% but little data exists on thyroid function levels in dysphonic patients, and the prevalence of undiagnosed thyroid disease in patients with dysphonia is yet to be determined.<sup>5</sup>

This study aims to evaluate the prevalence of previously undiagnosed hypothyroidism in patients with a primary complaint of dysphonia, hoarseness or vocal fatigue. We investigated whether the prevalence of hypothyroidism in this group differs significantly from the general public.

## Materials and Methods

This study was approved by the Institutional Research Board at Wake Forest University and combines a prospective study and a retrospective chart review. The prospective study collected data from medical records of new and/or existing patients that presented to the Department of Otolaryngology Center for Voice and Swallowing Disorders (CVSD) with a complaint of dysphonia, hoarseness and/or vocal fatigue from 2009 through present. The retrospective chart review captured data from medical records from 2007 to 2009 when the prospective data collection began.

951 patients presented to the CVSD with a new complaint of hoarseness, dysphonia, or vocal fatigue during the study period. 154 patients were identified as qualifying participants who met all inclusion and exclusion criteria. As part of the patient’s routine, scheduled clinic visit, if thyroid stimulating hormone level (TSH) had not been ordered in the last 6 months, a TSH lab draw was obtained from each subject. Demographic information collected included gender, age, race, weight, height, and calculated BMI. The TSH level and the voice handicap index (VHI) score were also obtained.

All analyses were performed with Sigma Stat 3.5, SPSS (SPSS, Inc., Chicago). Estimates of hypothesized rates of hypothyroidism were obtained based on a One-Sample Binomial Test. A P value of <.05 was considered indicative of statistical significance. A power analysis was completed, 68 patients were needed to have a 90% chance of detecting a significant difference using a two-sided test with p-value 0.05.

## Results

- 951 new healthy adults presented to the Wake Forest CVSD with a chief complaint of dysphonia.
- 154 patients met criteria to participate in the study.
- Data collection included
  - Voice Handicap Index (VHI),
  - Age
  - Sex
  - Thyroid Stimulating Hormone level (TSH).
- There were a total of 111 females and 43 males.
- Average age was 56.9 years old, average BMI was 28.6, and average VHI was 18.8. The average TSH obtained from all subjects was 1.97 mIU/L (normal TSH 0.4-5.5mIU/L).
- In the subject pool from CVSD **2.6% of patients with a chief complaint of dysphonia were found to have an abnormally high TSH.** Of the patients with TSH >5.5 mIU/L, 50% were 60 years of age or greater, and 75% were female.



## Discussion

If hypothyroidism is allowed to go untreated for a prolonged period of time, the soft tissues of the body become edematous. Myxedema increases protein and acid mucopolysaccharide content of connective tissue cells producing a viscid fluid. Most authors state progressive hoarseness in patients with hypothyroidism is due to the distorted, edematous vocal folds caused by laryngeal myxedema.<sup>2,7</sup> In milder cases of hypothyroidism, vocal changes are not as obvious. In fact the laryngeal examination is frequently normal in the hypothyroid patient, despite subjective dysphonia.<sup>4</sup>

Hoarseness affects nearly one-third of the population at some point in their life.<sup>11</sup> The National Health and Nutrition Examination Survey of 4,392 individuals reflecting the US population reported overt hypothyroidism in 0.3% of the population.<sup>5</sup> Our study reveals the prevalence of thyroid disease in patients with a chief complaint of dysphonia, who present to the CVSD of 2.6%. There was no association between age, BMI, or VHI with TSH. TSH and VHI were compared, using a tailed t-test, there was weak to no correlation and no linear association between VHI and TSH (0.09, p=.276). If symptoms, as measured by VHI, are not a reliable method of hypothyroidism disease severity, it may make dependence on the physical exam all the more important.

Currently the TSH cutoff for hypothyroidism at our lab is 5.5 mIU/L. Our prevalence of hypothyroidism at 2.6% was markedly elevated over the general population’s rate of 0.3%. When grouped by age, half of our hypothyroid patients (as indicated by TSH >5.5 mIU/L) were noted to be 60 years of age and older. Although we would advocate a thyroid work up for all dysphonic patients without a physical exam finding of paresis or paralysis, an even greater emphasis should be placed on the patient population over 60 years old.

## Conclusions

Our results suggest that hypothyroidism is more prevalent in patients with dysphonia than in the general population without dysphonia. This association is clinically relevant to the treatment of patients who present with voice complaints. TSH is simple screening test for the Otolaryngologist. In patients with no obvious physical exam finding to explain dysphonia, or with findings of myxedema, a thorough exam and clinical workup for thyroid disorders remains an important part of the evaluation.

### References

1. Ficarra BJ. Myxedatous hoarseness. Arch Otolaryngol. 1960;72:75-6.
2. Ritter FN. The effect of hypothyroidism on the larynx of the rat: an explanation for hoarseness associated with hypothyroidism in the human. Trans Am Laryngol Assoc. 1964;85:65-79.
3. White A, Sim DW, Maran AG. Reinke’s oedema and thyroid function. J Laryngol Otol. 1991;105(4):291-2.
4. Gupta OP, Bhatia PL, Agarwal MK, et al. Nasal, pharyngeal, and laryngeal manifestations of hypothyroidism. Ear Nose Throat J. 1977;56(9):349-56.
5. Aoki Y, Belin RM, Clickner R, Jeffries R, Phillips L, Mahaffey KR. Serum TSH and Total T4 in the United States Population and Their Association with Participant Characteristics: National Health and Nutrition Examination Survey (NHANES 1999-2002). Thyroid 2007; 12:1211-1223.
6. Lindholm J, Lauberg P. Hypothyroidism and thyroid substitution: historical aspects. J Thyroid Res. 2011;2011:809341. Epub 2011 Jun 8..
7. Frank N. Ritter, M.D. Ann Arbor, Mich.The effects of hypothyroidism upon the ear, nose and throat : A clinical and experimental study. Laryngoscope. 1967;77:1427-79.
8. Bicknell PG. Mild hypothyroidism and its effects on the larynx. J Laryngol Otol 1973; 87:123-7.
9. Altman KW, Haines GK 3rd, Vakkalanka SK, Keni SP, Kopp PA, Radosevich JA. Identification of thyroid hormone receptors in the human larynx. Laryngoscope. 2003;113(11):1931-4.
10. Rapp MF, Guram M, Konrad HR, Mody N, Trapp R. Laryngeal Involvement In Scleromyxedema: A Case Report. Otolaryngol Head Neck Surg. 1991;104(3):362-5.
11. Seth R. Schwartz, Seth M. Cohen, Seth H. Dailey, Richard M. Rosenfeld, Ellen S. Deutsch, M. Boyd Gillespie, Evelyn Granieri, Edie R. Hapner, C. Eve Kimball, Helene J. Krouse, J. Scott McMurray, Salfar Medina, Karen O’Brien, Daniel R. Ouelllette, Barbara J. Messinger-Rapport, Robert J. Stachler, Steven Strode, Dana M. Thompson, Joseph C. Stemple, J. Paul Willging, et al. Clinical Practice Guideline. Oto Head and Neck Surg. 141; 2009;(3) S1-S32.)