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Voice Therapy Associated With a Decrease in the Reflux Symptoms Index in Patients With Voice Complaints

Sarah L. Schneider, MS, CCC-SLP,

Department of Otolaryngology–Head and Neck Surgery, University of California, San Francisco, San Francisco, California

Matthew S. Clary, MD,

Department of Otolaryngology, University of Colorado School of Medicine, Aurora, Colorado

Daniel Steven Fink, MD,

Department of Otolaryngology, University of Colorado School of Medicine, Aurora, Colorado

Sean X. Wang, MD,

Sutter Health, Fremont, California

Farshad N. Chowdhury, MD,

Department of Otolaryngology, University of Colorado School of Medicine, Aurora, Colorado

Rena Yadlapati, MD, MSHS,

Division of Gastroenterology and Hepatology, University of Colorado School of Medicine, Aurora, Colorado

Marie E. Jetté, PhD, CCC-SLP, and

Department of Otolaryngology, University of Colorado School of Medicine, Aurora, Colorado

Mark S. Courey, MD

Department of Otolaryngology–Head and Neck Surgery, Mount Sinai Health System, New York, New York, U.S.A.

Abstract

Objectives/Hypothesis: Patients with muscle tension dysphonia often demonstrate an elevation in Reflux Symptom Index (RSI) and 10-item Voice Handicap Index (VHI-10) scores, and may be erroneously diagnosed with laryngopharyngeal reflux disease. In this study we assessed the effects of voice therapy on RSI and VHI-10 scores in patients with voice complaints not responsive to antireflux medications.

Study Design: Retrospective cohort study.

Methods: A study of patients was conducted at a single tertiary-care center over 1 year (January 2012–January 2013). Patients were included if they had dysphonia not responsive to proton pump inhibition, did not have neurologic or neoplastic disease, and participated in at least three voice-

Send correspondence to Mark S. Courey, MD, 5 East 98th Street, 8th Floor, New York, NY 10029. mark.courey@mountsinai.org. Presented at the Fall Voice Conference, Atlanta, Georgia, U.S.A., October 18, 2013.

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therapy sessions in the absence of antireflux therapy. Primary analysis assessed change in RSI scores between the initial and follow-up visits with a laryngologist.

Results: A total of 18 patients were included (mean age = 49.9 ± 14.5 years, 89% female, 83% with a primary complaint of dysphonia). From initial to follow-up visit, the median RSI score (18.5 [interquartile range {IQR}, 9.5–22.8] vs. 10.5 [IQR, 4.5–14]; $P = .02$) and median VHI-10 score (25.5 [IQR, 11.3–30.0] vs. 13.5 [IQR, 9.5–20.8]; $P = .03$) significantly decreased. A significant inverse correlation was found between the number of voice therapy sessions/month and change in RSI score ($r = -0.4$; $P = .05$).

Conclusions: In this study of patients with muscle tension dysphonia or vocal hyperfunction not responsive to antireflux therapy, RSI and VHI-10 scores improved following voice therapy. Results suggest that self-reported symptoms typically attributed to laryngopharyngeal reflux disease may actually be secondary to inefficient voice use patterns or anxiety about dysphonia that are responsive to voice therapy.

Keywords

Muscle tension dysphonia; reflux symptom index; laryngopharyngeal reflux

INTRODUCTION

Though dysphonia may arise from a variety of underlying etiologies ranging from structural to neurologic to behavioral mechanisms, dysphonia is frequently attributed to laryngopharyngeal reflux disease (LPRD) and treated accordingly despite an unclear relationship between objective esophagopharyngeal reflux and voice symptoms.^{1–3} Up to 30% of adults report dysphonia at some point in their lifetimes, and more than 60% of patients with dysphonia miss work because of it.^{1,3} Muscle tension dysphonia (MTD), a voice disorder characterized by laryngeal muscle hyperfunction, is estimated to account for 10% to 40% of all cases seen in multidisciplinary voice disorder clinics and often diagnosed after empirical treatment for reflux has failed. Although the specific causes of MTD are unknown, LPRD is not believed to be a primary driver of symptoms.² Still, antireflux therapies are widely used to treat the majority of patients with voice disorders. For instance, otolaryngologists empirically prescribe proton pump inhibitors (PPIs) 58% of the time to treat dysphonia in patients with structurally normal vocal folds. Furthermore, up to 85% of primary care physicians routinely prescribe antireflux medication to treat chronic hoarseness of unknown origin in patients who have not had a prior laryngoscopic examination.^{3,4}

The supposition that LPRD is the generating mechanism of dysphonia is augmented by the Reflux Symptom Index (RSI), a patient-reported outcome instrument commonly used to assess LPRD treatment outcomes.⁵ The RSI assesses nine symptoms that span both voice and traditional gastroesophageal reflux symptoms and includes items such as heartburn, cough, globus, and voice dysfunction.^{5,6} Although LPRD is a physiologically plausible explanation for dysphonia, randomized controlled trials assessing the utility of antireflux therapy to improve voice outcomes have demonstrated mixed results.^{7–9} Moreover, studies have demonstrated that non-LPRD cases of dysphonia demonstrate elevated RSI scores and that voice therapy may improve RSI scores in LPRD patients when used both with and

without a PPI.^{3,10,11} In this study, we seek to 1) investigate the symptom burden, as measured by the RSI and 10-item Voice Handicap Index (VHI-10), among patients with MTD not responsive to PPIs, and 2) measure the change in symptom burden following voice therapy. We hypothesize that patients with MTD may demonstrate an elevation in their RSI and VHI-10 scores secondary to inefficient voice use patterns rather than due to LPRD itself, and that symptoms are responsive to voice therapy.

MATERIALS AND METHODS

Study Design and Subjects

This retrospective cohort study assessed consecutive patients with dysphonia refractory to PPI therapy treated with voice therapy at a tertiary-care voice and swallowing center from January 2012 to January 2013. This study was approved by University of California, San Francisco Institutional Review Board. Patients were included if they were 18 years or older, had a prior diagnosis of LPRD but their symptoms had not responded to antireflux management, were assigned a primary diagnosis of vocal hyperfunction or MTD, and underwent a minimum of three voice-therapy sessions following initial presentation. Patients were excluded if they had a neurologically based voice disorder (e.g., vocal fold paralysis or paresis, spasmodic dysphonia, or vocal tremor). Patients were excluded if they underwent surgical interventions on the vocal folds between the initial and follow-up visits, if RSI and VHI data from two visits were incomplete, if they continued acid suppression therapy between visits, or if the initial and follow-up visits were > 8 months apart. Demographic information, medications, past medical history, chief complaint, and principle and concurrent diagnoses were obtained, along with RSI and VHI-10 scores at the initial and follow-up visits with the treating laryngologist.

Diagnosis of MTD or Vocal Hyperfunction

Diagnosis of MTD was a diagnosis of exclusion and was based on clinical history, complete head and neck examination including laryngeal visualization, and auditory–perceptual evaluation of voice. Patients had more than 3 weeks of self-described voice changes with or without other symptoms. Neck palpation was positive for reduced thyrohyoid space and/or tenderness upon manipulation. Laryngeal examination across multiple phonatory tasks revealed an absence of laryngeal disease, normal mobility of the arytenoids and vocal folds, and presence of lateromedial and/or anterolateral supraglottal compression. Vocal fold vibratory parameters were assessed using a stroboscopic light source and revealed intact vocal fold vibration and complete closure of the musculomembranous vocal folds. Auditory–perceptual analysis by a multidisciplinary team composed of a laryngologist and speech–language pathologist was positive for findings of roughness, breathiness, and/or strain in the vocal signal.

Voice Therapy Intervention

Voice therapy was tailored to the individual patient and constituted a combination of one or more indirect and direct approaches. Indirect approaches included patient education such as discussion of normal anatomy and physiology of vocal production, the impact of muscle tension on function, and vocal hygiene considerations. Counseling was also included as an

indirect approach. Direct approaches included physiologic and symptomatic techniques to manipulate subsystems of voicing (i.e., respiration, phonation, and resonance). Voice therapy sessions were approximately 50 minutes in duration and occurred at a frequency of once per week to once per month. All sessions were completed 1:1 with a speech language pathologist in a private therapy room at an outpatient clinic.

Statistical Analysis

Analyses utilized all available data from patients meeting inclusion criteria. There were no formal power calculations for this exploratory study, and we did not impute missing data. The primary outcome was the RSI score, and the secondary outcome was the VHI-10 score.

In the primary analysis we aimed to assess the association between voice therapy and symptom response among all included patients. In the subanalysis we assessed the subgroup of patients with an RSI ≥ 13 at the initial visit as a measure of patients with an abnormally elevated RSI score.⁵ RSI and VHI-10 scores were compared at the initial and follow-up visit via Mann-Whitney *U* test for nonparametric data. In a post hoc analysis we tested the correlation between change in RSI score and number of voice-therapy sessions per month via Pearson linear regression. Statistical significance was defined as a *P* value $< .05$. Data analysis was performed using Stata version 14.2 (StataCorp, College Station, TX).

RESULTS

Baseline Characteristics

Overall, 18 patients met inclusion criteria and were included in the analysis. The mean age was 49.9 ± 14.5 years, and 16 (89%) were female. The majority (83%, $n = 15$) primarily complained of dysphonia, with two (11%) experiencing chronic cough complaints and one (6%) experiencing throat clearing. At the initial visit, the median RSI score was 18.5 (interquartile range [IQR], 9.5 to 22.8) and median VHI-10 score was 25.5 (IQR, 11.3 to 30.0). Twelve (67%) patients had an initial RSI score ≥ 13 . Overall, patients completed a median of four voice-therapy sessions (IQR, 3 to 4.5). The median time from initial visit to follow-up visit with a laryngologist was 5 months (IQR, 4.8 to 7.0), and the median number of therapy visits per month was 0.8 (IQR, 0.7 to 1.0) (Table I).

Primary Analysis: Change in Symptom Scores Following Voice Therapy

Between the initial and follow-up visit, the RSI score decreased by a median of 7.0 (IQR, 2.3 to 10.0) points. Fourteen (78%) patients had an improvement in RSI score. The median RSI score at the follow-up visit was significantly lower compared to the initial visit (10.5 [IQR, 4.5 to 14] vs. 18.5 [IQR, 9.5 to 22.8]; $P = .02$) (Fig. 1, Table II). Specifically, the majority of patients had an improvement in globus (12, 67%), hoarseness (10, 56%), throat clearing (10, 56%), and mucus (nine, 50%) symptoms. A minority of patients reported improvement in chest pain or heartburn (five, 28%) and cough (seven, 39%).

Between the initial and follow-up visit the VHI-10 score decreased by a median of 6.0 (IQR, -0.8 to 14.5) points. Eleven (61%) patients had an improvement in VHI-10 score. The

median VHI-10 score at follow-up was significantly lower compared to the initial visit (13.5 [IQR, 9.5 to 20.8] vs. 25.5 [IQR, 11.3 to 30.0]; $P = .03$) (Table II).

Secondary Analysis: Change in Symptom Scores Among Subgroup With Initially Elevated RSI Scores

Among the subgroup of 12 patients with an initial RSI score ≥ 13 , the RSI score from initial and follow-up visit reduced by a median of 9.5 points (IQR, 4.8 to 14.5). Eleven (92%) had an overall improvement in RSI score. The median RSI score at follow-up was significantly lower compared to the initial visit (14 [IQR, 10 to 15] vs. 22 [IQR, 19 to 33]; $P < .01$) (Table II).

Between the initial and follow-up visit, the VHI-10 score reduced by a median of 7.5 points (IQR, -2 to 13.5). Seven (58%) patients had an overall improvement in VHI-10 score. The median VHI-10 score at follow-up was lower compared to the initial visit (16.5 [IQR, 10.5 to 22.0] vs. 26.0 [IQR, 15.3 to 30.5]; $P = .07$) (Table II).

Post Hoc Analysis

There was significant inverse correlation between the number of voice-therapy sessions per month and the change in RSI score ($r = -0.4$, $P = .05$) (Fig. 2).

DISCUSSION

In our referral practice, we often see patients diagnosed with LPRD, primarily based on an elevated RSI score, who have not responded to antireflux therapy. We observed significant overlap between symptoms commonly attributed to LPRD and MTD. Therefore, we hypothesized that behavioral voice therapy, which is effective for patients with MTD, might alleviate these patients' symptoms and result in reductions in the RSI score that did not occur with reflux management. In this study, we examined RSI and VHI-10 scores before and after voice therapy among 18 patients originally diagnosed with LPRD who did not respond to antireflux therapy. Our examination findings were most consistent with MTD and laryngeal hypersensitivity, including cough. The group on average had an elevated RSI score, with the majority (67%) above the established cutoff for the diagnosis of LPRD. In this group, voice therapy and the withdrawal of LPRD management was associated with significant reductions in RSI and VHI-10 scores. We take this to indicate that 1) patients with dysphonia may present with elevated RSI scores, 2) the RSI score is indicative of laryngeal irritation and not specific to LPRD, and 3) RSI scores may be normalized with voice therapy alone in a subset of dysphonic patients.

LPRD refers to reflux of gastric contents into the laryngopharynx of sufficient severity presumed to cause a constellation of symptoms including throat-clearing, cough, globus sensation, and hoarseness.⁸ Because a reliable, validated gold standard for LPRD does not exist, patient-reported symptoms are often used as a surrogate for LPRD diagnosis. For the potential diagnosis of LPRD, the RSI is the most commonly accepted patient-reported outcome measure (PROM). However, significant short-comings of the RSI include insufficient development rigor, poor specificity for LPR symptoms, and lack of content validity.¹² As a result, overreliance on the RSI likely contributes to the overdiagnosis of

LPRD. This may be one possible explanation for poor outcomes in meta-analyses of randomized controlled trials of PPI therapy, in that many patients thought to have LPRD and treated with PPI therapy do not actually have LPRD. Meta-analyses report that fewer than 50% of patients find symptom relief with PPI therapy. Furthermore, it is possible that reflux of nonacidic gastric contents, such as pepsin and bile, contribute to generation of laryngeal symptoms and potentially irritation. In this setting of nonacidic LPRD, acid suppression with PPI therapy is unlikely to result in symptom improvement. Unfortunately, in the setting of PPI nonresponse, most patients subsequently undergo a battery of unreliable diagnostic tests and consultations, often without diagnostic clarity.^{13,14} This paradigm contributes to inefficient use of an estimated \$50 billion in healthcare dollars annually.¹⁴

Another challenge with the RSI is that it encapsulates a spectrum of symptoms including voice complaints and typical symptoms of gastroesophageal reflux. As a result, isolated improvements in reflux without impacting voice symptoms could translate to an overall reduction in RSI and misrepresent treatment effect.¹⁵ Interestingly, in our study we examined the relationship between voice therapy and change in the subscores of the RSI. The majority of patients reported improvement in globus, throat clearing, hoarseness, and mucus, whereas a minority reported an improvement in gastroesophageal reflux symptoms (e.g., heartburn). This finding suggests that voice therapy effectively targets voice and laryngeal symptoms.

Prior studies have examined the role of combination treatment with voice therapy and antireflux management. For instance, Cohen et al. found that among 264 patients on PPI therapy, 40% had signs of MTD, and 63% of the total group had further voice improvement with voice therapy after failing or plateauing on PPI therapy.³ Subsequently, Park et al. prospectively demonstrated that the combination of voice and PPI therapy provides a significantly greater improvement in RSI and VHI-10 scores than PPI alone in patients diagnosed with LPR based on the RSI or reflux finding score on laryngoscopy.¹¹ Our data support these findings and demonstrate that the symptoms queried in the RSI may capture patients with dysphonia and laryngeal complaints from non-LPRD conditions such as MTD, and laryngeal hypersensitivity-related cough. In these cases, evaluation by a voice-trained speech–language pathologist to assess stimulability and candidacy for voice therapy is warranted and may lead to significant benefit from voice–therapy alone.

There are important limitations to this study. In addition to the retrospective nature of this review and lack of a control group not receiving voice therapy, our study is limited by the possibility of selection bias in that only patients with elevated RSI scores who were nonresponders to antireflux therapy were referred to our center. Despite a small sample size, results suggest that the study is adequately powered to observe the anticipated treatment effect, and is sufficiently hypothesis generating. The study population also represented a heterogeneous group with variability in prior LPRD diagnosis and past antireflux regimens.

CONCLUSION

In patients diagnosed with LPRD based on symptoms and/or an elevated RSI score, who do not respond to antireflux management, voice therapy for MTD and cough results in a

reduction of atypical symptoms and an overall reduction in the RSI. This indicates that the RSI, as a PROM, is a nonspecific indicator of laryngeal irritation rather than a specific indicator of LPRD. Voice therapy is effective at reducing the RSI for the management of patients with laryngeal disorders due to MTD, and should be included in the treatment of patients with dysphonia who fail to respond to antireflux management.

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Fig. 1. Change in RSI score between initial and follow-up visits by patients. RSI = Reflux Symptom Index. [Color figure can be viewed in the online issue, which is available at www.laryngoscope.com.]

Fig. 2.

Correlation between the delta in RSI and the number of visits per month ($r = -0.4$, $P = .05$).

RSI = Reflux Symptom Index. [Color figure can be viewed in the online issue, which is available at www.laryngoscope.com.]

TABLE I.

Baseline Characteristics of Patients (N = 18)

Baseline Characteristic	
Mean age, yr (SD)	49.9 (14.5)
Female sex, n (%)	16 (89%)
Primary symptoms, n (%)	
Dysphonia	15 (83%)
Chronic cough	2 (11%)
Throat clearing	1 (6%)
Median no. of voice therapy sessions (IQR)	4.0 (3–4.5)
Median time from initial visit to follow-up with laryngologist, mo (IQR)	5 (4.3–7)
Median no. of therapy sessions/month (IQR)	0.8 (0.6–1.0)

IQR = interquartile range; SD = standard deviation.

TABLE II.

Change in Symptom Scores Following Voice Therapy

	Initial Visit, Median (IQR)	Follow-up Visit, Median (IQR)	Overall Improvement, No. (%)	Overall Change in Score, Median (IQR)	<i>I</i> <i>P</i> Value
Total group, n = 18					
Reflux Symptom Index	18.5 (9.5 to 22.8)	10.5 (4.5 to 14.0)	14 (78%)	7.0 (2.3 to 10.0)	.02
VHI-10	25.5 (11.3 to 30)	13.5 (9.5 to 20.8)	11 (61%)	6.0 (−0.8 to 14.5)	.03
Subgroup of patients with initial RSI 13, n = 12					
Reflux Symptom Index	21.5 (19.3 to 33.3)	14.0 (10.0 to 15.0)	11 (92%)	9.5 (4.8 to 14.5)	<.01
VHI-10	26.0 (15.3 to 30.5)	16.5 (10.5 to 22.0)	7 (58%)	7.5 (−2.0 to 13.5)	.07

I *P*-value indicates comparison between initial visit and follow-up visit score, and was calculated via Mann-Whitney *U* test.

IQR = interquartile range; RSI = Reflux Symptom Index; VHI-10 = 10-item Voice Handicap Index.