Comparing Short-term Outcomes of Surgery and Voice Therapy for Patients With Vocal Fold Polyps

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Objectives/Hypothesis: Optimal treatment for patients with vocal fold polyps (VFPs) remains controversial. We compared the short-term outcomes of treatment with voice therapy alone (VT), surgery alone (SUR), or voice therapy and surgery (VTS).

Study Design: Retrospective case series.

Methods: A retrospective study was performed for patients diagnosed with VFP (International Classification of Diseases, Ninth Revision code 478.4 and Tenth Revision code J38.1) between January 2010 and April 2016. Inclusion criteria were age greater than 18 years and charted evidence of treatment with voice therapy, surgery, or both. Exclusion criteria were history of laryngeal cancer or radiation above the clavicles. Outcomes measured included chart records of lesion absence, persistence, or recurrence, and differences between pretreatment and post-treatment Voice Handicap Index-10 and GRBAS (G/grade, R/roughness, B/breathiness, A/asthenia, S/strain) scores.

Results: One hundred twenty patients with VFPs were identified (SUR = 23, 19.2%, VT = 29, 24.2%, VTS = 68, 56.7%). Mean follow-up was 5.5 months. There were no recurrences in 115 patients (95.8%). There was significant improvement from pre- to post-treatment VHI-10 scores in the SUR (mean improvement = 12.5, standard deviation [SD] = 12.7) and VTS (mean improvement = 12.3, SD = 10.3) groups compared to the VT (mean improvement = 2.84, SD = 11.9) group (P = .009). Pre- and post-treatment GRBAS scores did not significantly change in any group.

Conclusions: When using patient-reported outcomes measures, patients with VFPs receive the greatest short-term gains from treatment paradigms involving surgery or a combination of surgery and voice therapy. Voice therapy alone did not result in significant short-term changes. Perceptual voice characteristics did not change significantly for any group. Further research on long-term treatment outcomes for patients with VFPs is needed.

Key Words: Polyps, phonosurgery, voice therapy, patient-reported outcomes.

Level of Evidence: 3

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INTRODUCTION

Vocal fold polyps (VFPs) are benign lesions that develop secondary to vocal behavioral inefficiencies. These lesions can cause significant distress, decreased quality of life, and disability, especially for patients who use their voice in their occupation. Historically, phonosurgery was the primary treatment for patients with vocal fold polyps. However, because vocal behaviors likely play a role in polyp formation, it is reasonable to evaluate the role of voice therapy in the treatment of patients with vocal fold polyps. Traditionally, voice therapy has been offered to patients with either vocal fold nodules, patients who cannot tolerate surgery, or patients who have already received surgery for vocal fold granulomas, polyps, or cysts.

Currently, there is no consensus on using voice therapy as a first-line treatment for patients with vocal fold polyps. Most previous studies that have evaluated nonsurgical treatment modalities have either had a small sample size, did not specifically use voice therapy, did not use validated measurements for assessing voice improvement, or did not have statistical significance. This study aims to compare subjective and objective voice outcomes in patients with vocal fold polyps who received voice therapy, surgery, or a combination of voice therapy and surgery. Voice outcomes were evaluated using patient-reported measures (Voice Handicap Index–10 (VHI-10) and semiobjective perceptual voice analysis (GRBAS [G/grade, R/roughness, B/breathiness, A/asthenia, S/strain]). The objective was to determine differences between results in treatment modalities for patients with VFPs.

MATERIALS AND METHODS

This study was conducted as a retrospective review of patients from the laryngology division of the Mount Sinai Health System and was approved by the institutional review board. Charts reviewed included patients seen between January 2010 and April 2016 who had the appropriate International Classification of Diseases, Ninth Revision code (478.4) for VFPs or Tenth Revision code (J38.1) for VFPs.

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Classification of Diseases, Ninth Revision and Tenth Revision codes including 478.4 (polyp of the vocal cord or larynx), 478.5 (other disease of the vocal cord), and 478.79 (other diseases of larynx, not elsewhere classified).

Inclusion criteria were patients with VFPs seen between the dates listed above who had voice therapy, surgical intervention or both, and age greater than 18 years at the time of intervention. Exclusion criteria were patients who had a history of laryngeal cancer or received radiation for any reason above the clavicles. Patients were then split into three categories: 1) voice therapy only (VT), 2) surgery only (SUR), and 3) voice therapy and surgery (VTS). Data that were obtained from the medical records included demographics (age and gender), type of intervention, laterality of vocal fold polyp, if vocal cord polyp recurred on exam, how long after intervention the patient had recurrence, physical exam, and symptomatic improvement, GRBAS and VHI-10 scores (pre- and post-treatment).

To confirm the physical exam findings from the medical records, and to address the variable of multiple speech-language pathologists (SLPs) rating GRBAS scores in the retrospective chart review, 10% of patients were randomly selected to be in a sample cohort. Their pre- and postintervention laryngeal examinations and voice evaluations were blindly reviewed respectively by two fellowship-trained laryngologists with 5 and 30 years experience, respectively, and an SLP with more than 10 years experience in managing patients with voice difficulties. To assess intrarater reliability, 10% of these randomly selected exams were repeated in a random manner. The physicians assessed the exams for presence, characteristics, and size of the polyp. Size and characteristics were graded as ≤50% of the vocal fold length, ≥50% of the vocal fold length, <50% of the vocal fold width, ≥50% of the vocal fold width, if the polyp was sessile or pedunculated, and if the polyp was vascular or gelatinous. Anchors were provided to both laryngologists. The SLP performed perceptual evaluations using the GRBAS format from recorded voice samples and scored each category on a standard 0 to 3 scale.

Statistical Methods
Descriptive statistics were generated to describe the sample characteristics. Data were summarized as proportions of each group meeting criteria for symptomatic resolution as well as resolution on physical exam. Statistical tests of significance (Pearson χ² test and one-way analysis of variance) were performed using a significance level of P < .05. Inter- and intrarater reliability were calculated for our review of laryngeal examinations and GRBAS scoring. Data were analyzed using JMP Pro 13 (SAS Institute Inc., Cary, NC).

RESULTS
A total of 120 patients were identified who met our inclusion criteria. Of these, 63 (52.5%) were male and 57 (47.5%) were female, with an average age of 42.9 years. Right-sided lesions were present in 53 (44.2%) patients, left-sided lesions in 51 (42.5%) patients, and bilateral lesions in 16 (13.3%) patients. Of the patients identified, 23 (19.2%) patients were in the SUR group, 29 (24.2%) patients were in the VT group, and 68 (56.7%) patients were in the VTS group. Mean follow-up was 5.5 months.

Of the 10% of random examinations reviewed in the sample cohort, the raters agreed with the original chart reports 85.1% of the time when looking at absence or presence of vocal fold polyp. Inter-rater reliability for the reviewers was 81.1% based on presence or absence of vocal fold polyp and 88.2% based on size and configuration characteristics. Intrarater reliability was 100% on repeated samples. Our SLP rater agreed with chart-recorded GRBAS characteristics 85.3% of the time. SLP intrarater reliability was 65% when exact ratings for each category were analyzed or 100% if the value for each category was allowed to vary by one point up or down.

Of the 120 patients identified, 70 patients had both pre- and postintervention VHI-10 scores. Preintervention VHI-10 scores were 15.4 (standard deviation [SD] = 10.1) in the VT group, 22.2 (SD = 7.4) in the SUR group, and 21.2 (SD = 9.2) in the VTS group. The differences in pretreatment VHI-10 means were statistically significantly different (P = .015). Postintervention, there was no statistical difference in VHI-10 scores between groups as a whole or between any two specific groups. There was a significant improvement from pretreatment GRBAS scores in the SUR group (mean improvement = 12.5, SD = 12.7) and VTS (mean improvement = 12.3, SD = 10.3) compared to the VT group (mean improvement = 2.84, SD = 11.9) group (P = .009).

Both pre- and postintervention GRBAS scores were available from 103 patients and improved in one to two grades in all three groups. However, using nonparametric analysis methods, these differences between groups were not statistically significant. Modal pre- and postintervention GRBAS scores are listed in Table I and mean change by group can be seen in Table II.

Resolution of the polyp was defined as complete resolution with no residual physical exam findings on videostroboscopy as reported in medical charts or voice back to

| TABLE I. Modal GRBAS Scores Pre- and Postintervention by Group. |
|-----------|-----------|-----------|-----------|
| GROUP     | Pre       | Post      | Pre       | Post      |
| G         | 2         | 1         | 2         | 1         |
| R         | 2         | 1         | 1         | 2         |
| B         | 1         | 1         | 1         | 0         |
| A         | 1         | 0         | 1         | 0         |
| S         | 2         | 0         | 1         | 0         |

GRBAS = G/grade, R/rougness, B/breathiness, A/asthenia, S/strain; SUR = surgery alone; VT = voice therapy alone; VTS = voice therapy and surgery

| TABLE II. Mean Differences in Pre- and Postintervention GRBAS Scores by Group. |
|-----------|-----------|-----------|-----------|-----------|
|           | SUR (n = 15) | VTS (n = 60) | VT (n = 28) | P Value   |
| G change  | 0.78       | 0.83       | 0.72       | 0.81      |
| R change  | 0.88       | 0.80       | 0.71       | 0.75      |
| B change  | 0.65       | 0.89       | 0.71       | 0.48      |
| A change  | 0.73       | 0.68       | 0.35       | 0.13      |
| S change  | 0.77       | 0.71       | 0.64       | 0.90      |

Differences between groups were calculated by an analysis of variance test and there was no statistical significance between groups. GRBAS = G/grade, R/rougness, B/breathiness, A/asthenia, S/strain; SUR = surgery alone; VT = voice therapy alone; VTS = voice therapy and surgery

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baseline according to the patient. Complete physical resolution of polyp was seen in 73.9% (n = 17) of the SUR group, 27.6% (n = 8) of the VT group, and 85.3% of the VTS group (n = 58). This difference was significant between groups (P < .0001). Complete symptomatic resolution was seen in 56.5% (n = 13) of the SUR group, 41.4% (n = 12) of the VT group, and 64.7% of the VTS group (n = 44). These differences were not statistically significant. Recurrence of vocal cord polyp was only seen in 3.3% of patients (n = 4) at an average of 11.4 months after initial intervention. There was no difference between groups when looking at recurrence.

The majority of polyps in the sample cohort were <50% of the vocal fold in length and ≤50% of the vocal fold in width. There were only three patients in the review sample cohort with polyps ≥50% the length and only five patients in the review sample cohort with polyps >50% the width of the vocal fold. All patients with polyps ≥50% of the vocal fold length or width received surgical intervention, with or without voice therapy. When looking at polyp subtype (vascular, gelatinous, pedunculated, or sessile), there was no association with polyp subtype and type of intervention.

**DISCUSSION**

Management of patients with benign vocal lesions such as vocal fold nodules, polyps, or cysts includes voice therapy or surgical intervention. VT has been consistently agreed to be standard of care and first-line treatment of patients with vocal fold nodules. However, the standard of care for patients with VFPs has not been established. The lack of general consensus is made evident by a survey of members of the American Academy of Otolaryngology–Head and Neck Surgery, which demonstrated that 91% of respondents use VT as first-line treatment for nodules, but were divided regarding the use of VT as initial treatment for polyps and cysts, constituting 30% and 22%, respectively. Several studies support the utility of VT as the mainstay treatment of patients with VF polyps, whereas others note phonosurgery to be the preferred treatment strategy. These previous studies have been limited by small sample sizes, lack of validated outcome measures, or lack of statistical significance. Similar studies with larger sample sizes, typically included all benign midmembranous vocal lesions rather than a focus on VFPs. This current study compares subjective and objective voice outcomes of patients diagnosed with polyps who were managed with VT alone, surgery alone, or surgery and VT. The validity of the retrospective chart review of findings was established by a blinded retrospective review of 10% of recorded laryngeal examinations and perceptual voice evaluations. There was an excellence concordance between the chart reports and the blinded new reviewers.

Our study showed that surgery alone or surgery with voice therapy produced significantly greater improvement in patient-reported outcomes on the VHI-10 than voice therapy alone. However, although the patients who had surgery alone or surgery with voice therapy had significant improvement in patient-reported outcome measures, there was no significant difference in their GRBAS score improvement over those who had voice therapy alone. These short-term results suggest that surgery or a combination of surgery and voice therapy lead to significantly greater vocal improvement than voice therapy alone in patients with VFPs.

Our study also evaluated complete physical and symptomatic resolution of the lesion and self-perceived vocal difficulties on physical exam and symptoms. The null hypothesis was that all subgroups would have no difference, and resolution was defined as complete resolution on physical exam or symptoms. Our results showed a significant difference in subgroups for complete resolution on physical exam; however, there was no significant difference looking at self-reported symptom resolution. These results can be explained by the fact that surgical intervention should fully remove the VFP, so remnant disease should be less commonly found postoperatively in the groups with surgical intervention. Recurrence of polyps was only seen in 3.3% of patients at an average of 11.4 months. This was not statistically significantly different between the groups. However, longer follow-up is needed to assess potential recurrent rates in patients who have not been able to identify and eliminate the inefficient vocal behaviors that may have led to VFP development.

The main limitation with this study is that secondary to the retrospective nature, we were unable to determine the individual patient factors that led to choice of treatment options. Patients who underwent surgery with or without voice therapy had greater self-reported voice handicap at presentation than those who had voice therapy alone. This pretreatment difference was statistically significant, and may have led to a source of bias in treatment group selection. Although all groups ended with statistically similar VHI-10 and GRBAS scores, it could be that the patients with the greatest preintervention handicap were preferentially selected for surgery. When we reviewed a sample of laryngeal examinations, patients with polyps larger than 50% of vocal fold length or width received surgical intervention, with or without voice therapy. This also suggests that patients with larger polyps may have been preferentially selected for surgical intervention. This selection bias could also have resulted in the underestimation of the role of voice therapy in all patients with vocal fold polyps. Another limitation of this study is that polyp subtype was not assessed. However, in our review of videostroboscopy examinations of a small sample of the patient population, polyp subtype was not associated with any specific intervention.

Other limitations of our study include that specific methods of voice therapy used were not identified for each patient, GRBAS scoring was performed by multiple providers, and we only have short-term follow-up. Going forward, it will be important to obtain long-term follow-up and to possibly perform a prospective study comparing outcomes from VT, SUR, or VTS.

**CONCLUSION**

The optimal treatment modality for VFPs remains controversial. VT, SUR, or VTS are treatment options.
The results of our study suggest that patients with VFPs receive the greatest short-term self-reported and physical improvements from treatment paradigms involving surgery or a combination of surgery and voice therapy when evaluated by patient-reported outcome measures and physical resolution on endoscopy. Semiojective GRBAS scores did not change significantly between the groups. In the future, a prospective study with longer-term follow-up is needed.

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BIBLIOGRAPHY