

# Current Practices for Voice Rest Recommendations After Phonomicrosurgery

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**Objectives/Hypothesis:** The aim of this study was to understand current protocols for voice rest implemented by laryngologists immediately after phonomicrosurgery for benign vocal fold lesions.

**Study Design:** Cross-sectional survey.

**Methods:** A 24-item survey was sent via electronic mail to laryngologists across the country to gather data on their recommendations of type and dosage of voice rest, factors involved in this decision, and recommendations for other behavioral modifications.

**Results:** A majority of the laryngologists implement 7 days of complete voice rest for nodules, cysts, polyps, and Reinke's edema, 1 to 4 days for leukoplakia and papilloma, and over 8 days of relative voice rest for most lesions. A majority of the laryngologists also employ a combination of complete and relative voice rest.

**Conclusions:** The more common recommendation for complete voice rest is 7 days for nodules, cysts, polyps, and Reinke's edema, and 1 to 4 days for leukoplakia and papilloma. Relative voice rest when recommended is typically recommended for over 8 days. Voice rest recommendations were not affected by surgery type alone, but were determined by either lesion type alone or lesion type combined with surgery type.

**Key Words:** Voice rest, voice conservation, phonomicrosurgery, postoperative voice rest.

**Level of Evidence:** 4.

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## INTRODUCTION

Vocal quality is largely dictated by the health of the vocal folds. The integrity of the layers of the vocal folds, especially of the cover of the vocal folds, is vital for good voice quality. We currently lack a complete understanding of the wound healing process of the vocal fold tissues.<sup>1</sup> Significant headway has been made in the basic sciences on examining tissue recovery at the cellular level,<sup>2–6</sup> but at this time, our clinical recommendations to maximize tissue pliability after phonosurgery are based on a small number of studies and anecdotal evidence.<sup>1,7,8</sup>

Approximately 11% of patients diagnosed with dysphonia have a benign lesion as the primary etiology.<sup>9</sup> A combination of surgical and behavioral therapy is utilized to minimize scarring that may result from iatrogenic trauma to the mucosa of the vocal folds or from unrestrained voice use.<sup>3,6,10–13</sup> Behavioral therapy includes voice rest (VR), voice therapy and recommendations for

level of physical activity, reflux management, and therapies such as hydration in the immediate postoperative period. Although there is no unified agreement on dosage, laryngologists can vary the recommendations for VR on a number of intrinsic factors that include the type and location of the lesion and incision, the surgical procedure implemented, the extent of mechanical trauma to the vocal fold structure in regard to depth and width of the incision during surgery, vocal load, and patient compliance.<sup>8,14–16</sup>

VR is a critical piece of rehabilitation for mucosal healing<sup>7,8,11,17</sup> after phonomicrosurgery, and the adequate evidence-based dosage has yet to be determined. Recommendation for VR is of two main types, complete/absolute voice rest (CVR) and relative/conservation voice rest (RVR). CVR typically includes an alternate mode of communication with no talking, whispering, or throat clearing.<sup>4</sup> This is thought to allow the tissue healing process after surgery.<sup>8</sup> RVR includes voice use limited only to essential needs and no phonotraumatic behaviors. Often, patients are provided with a maximum duration of allowable voice use per hour.<sup>5</sup> The early remobilization with RVR is thought to improve functional recovery and limit fibrosis.<sup>11</sup> Number of days of VR can range from 0 to 28 days and may be CVR and/or RVR.<sup>7,8</sup> In the absence of a consensus on a voice rehabilitation protocol, it is important to begin with current practices on recommendations and the factors that play a role in the decision making. A previous study by Behrman and Sulica<sup>7</sup> provided a good base of information; however, given that this study was published in 2003, there is a need to revisit current protocols. The aim of this study was to

Additional Supporting Information may be found in the online version of this article

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TABLE I.

Number of Responses and Percent of Total Responses That See 0 to 5, 5 to 10, 10 to 15, or Over 15 Patients Per Month of a Particular Benign Lesion Type.

Patients/ Month	Nodules, N (%)	Cysts, N (%)	Polyps, N (%)	Reinke's Edema, N (%)	Leukoplakia, N (%)	Papilloma, N (%)
0–5	<i>40 (47.6)</i>	<i>68 (80.0)</i>	27 (31.8)	43 (50.6)	28 (33.3)	39 (47.1)
5–10	26 (30.9)	10 (11.8)	<i>38 (44.7)</i>	23 (27.1)	32 (39.3)	31 (35.3)
10–15	8 (9.5)	4 (4.7)	14 (16.5)	13 (15.3)	18 (20.2)	9 (10.6)
>15	10 (11.9)	3 (3.5)	6 (7.1)	6 (7.1)	6 (7.1)	6 (7.1)

The largest response for each lesion type is italicized.

survey laryngologists on current practices in rehabilitation after phonosurgery. Questions on the survey were focused on training and work-setting information of the laryngologists, number of days and type of VR by lesion and surgery type, and recommendations for lifestyle modifications.

## MATERIALS AND METHODS

The study was approved by the institutional review board at the University of Houston. All participants provided consent prior to the initiation of the study. A 24-item survey (see Supporting Information, Appendix, in the online version of this article) was sent via electronic mail to laryngologists across the United States. The survey was implemented using Qualtrics (Provo, Utah) software<sup>18</sup> and was compatible for desktop and mobile use. The authors used the “Find an ENT” search option available on the website of the American Association of Otolaryngology–Head and Neck Surgery. The search generated a list of 618 members who had listed laryngology as a field of service. This number was smaller when those specializing in otology or rhinology, physicians outside the United States, and those with unlisted e-mails were excluded. Participants were sent up to five weekly reminders to complete the survey. The location of the participant was categorized to one of four regions—Northeast, Midwest, South, and West as defined by the United States Census Bureau.<sup>12</sup> They were provided working definitions of CVR and RVR as described previously, and were asked to complete the survey with their recommendations for VR immediately following phonosurgery. The survey was limited to vocal fold nodules, polyps, cysts, leukoplakia, Reinke's edema, and papilloma.

Data were collected on the demographics of the respondents, and laryngologists reported on the approximate number of patients with the specific benign lesions they saw each month, phonosurgical methods used, number of days and type of VR, and factors involved in the decision making. Other items included mode of providing information, recommendations for voice therapy, antireflux medications, diet, and lifestyle modifications. The survey was reviewed by three speech language pathologists, a laryngologist, and a biostatistician prior to initiating data collection. Due to the spread of data and the exploratory nature of the study, descriptive statistics were calculated for each of the questions, and an analysis of variance was performed on one question comparing VR and surgery types (cold knife vs. laser) using SPSS 22.0 (IBM, Armonk, NY)<sup>19</sup> and a mixed models analysis on the question on number of days of VR by lesion type.

## RESULTS

### Participant Demographics

E-mails were successfully delivered to 179 members, and we received 85 responses for a response rate of 47.5%.

This group of items included area of specialty, fellowship training, location, years of practice, practice setting, and number of patients treated for benign lesions. Respondents had to choose one or more of the applicable options for area of specialty—general laryngology, head and neck surgery, and pediatric laryngology. The majority of the respondents were general laryngologists (75.29%), followed by 17.65% who practiced both general laryngology and head and neck surgery. The remaining respondents selected general and pediatric laryngology (3.53%), head and neck surgery only (2.35%), and general laryngology, pediatric, and head and neck surgery (1.18%). There were no respondents who practiced only pediatric laryngology.

Eight respondents chose not to report their location. The remaining participants were located across all four regions of the United States—Northeast (25.37%), Midwest (26.87%), South (37.31%), and West (25.37%). A majority of the respondents (79.78%) were fellowship trained. Participants in this study had a wide range of years of experience: less than 5 years (21.18%), 5 to 9 years (27.06%), 10 to 14 years (16.47%), 15 to 19 years (14.12%), and more than 20 years (21.18%). Twenty percent of the respondents worked only in a private practice setting, 4.7% worked only in a hospital setting, and 49.41% practiced only in an academic setting. The remaining participants worked at both a hospital and private practice (4.7%) or an academic and other setting (21.2%).

The largest number of respondents reported seeing 0 to 5 patients monthly with nodules (47.62%), cysts (80%), Reinke's edema (50.59%), and papilloma (47.06%); and 5 to 10 patients monthly with polyps (44.71%) and leukoplakia (39.29%). The data are provided in Table I.

### VR Variables

Eighty-four out of the 85 respondents recommended some form of VR after phonosurgery. These questions (Fig. 1) pertained to the effect of surgery type (cold knife or laser) and lesion type on recommendations of number of days of VR and type of VR (CVR, RVR, CVR + RVR, or no rest). None of the laryngologists in this study changed the recommended number of days of VR based on surgery type alone, and only one decided the type of VR based on surgery type. Lesion type alone was a factor for the recommended number of days of rest (33%) and for the type of VR (31%), surgery with lesion type was a factor for recommended number of days for 25%, and type of VR for 22%. The remaining respondents, 42% for number of days of VR and

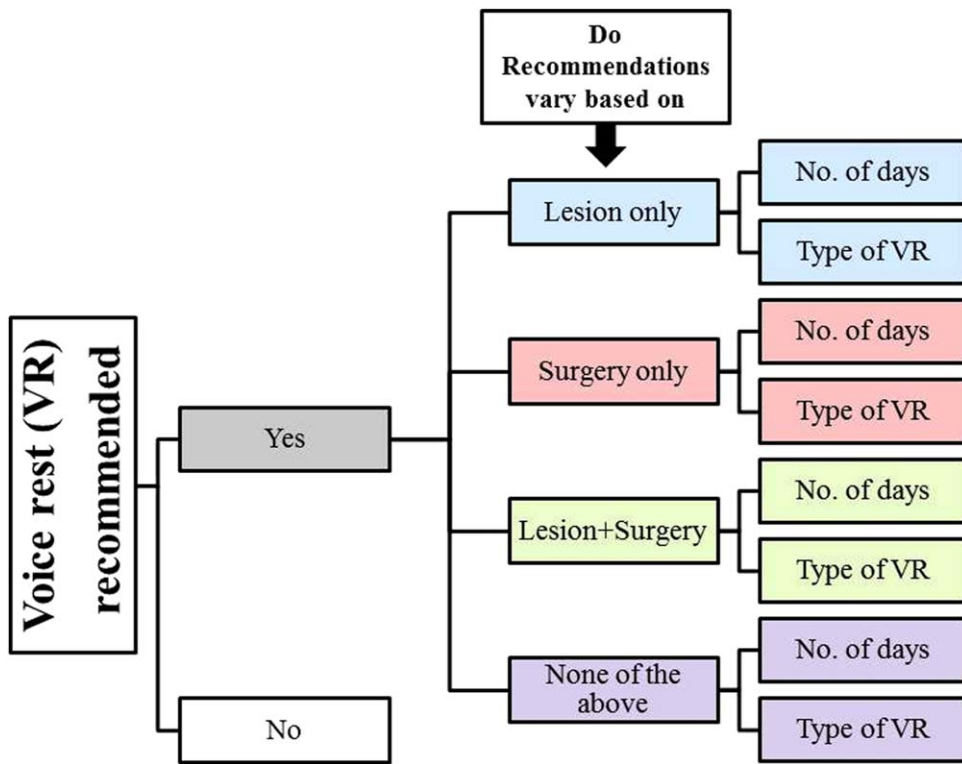


Fig. 1. Flowchart of questions for VR recommendations. VR = voice rest. [Color figure can be viewed in the online issue, which is available at [www.laryngoscope.com](http://www.laryngoscope.com).]

46% for type of VR, did not change their recommendations based on either surgery or lesion type.

**Lesion type as a factor.** Those participants that selected lesion type alone to be a factor in their decision

were asked to provide the number of days of VR for CVR and/or RVR for each benign lesion. The number of responses for each category are provided in Table II. Due to the small number of individuals recommending

TABLE II.  
Number of Responses Per Lesion Type for Number of Days of CVR, RVR, and CVR + RVR.

No. of Days	No. of Responses					
	Subepithelial Lesions				Epithelial Lesions	
	Nodules	Polyps	Cysts	Reinke's Edema	Leukoplakia	Papilloma
<b>CVR</b>						
0-2	1	0	0	1	4	7
3-4	5	7	2	6	6	6
5-6	5	4	7	3	2	3
7	7	8	10	9	2	2
8-14	1	1	0	0	0	0
Total no.	19	20	19	19	14	18
<b>RVR</b>						
0-2	1	1	1	1	2	4
3-4	0	1	0	2	4	4
5-6	1	0	1	1	2	1
7	6	6	4	5	3	3
8-35	7	9	10	9	5	4
Total no.	15	17	16	18	16	16
<b>CVR + RVR</b>						
Did not provide no. of days	2	0	0	0	1	0

The largest response for each lesion is italicized.  
CVR = complete voice rest; RVR = relative voice rest.

TABLE III.  
Number of Responses per Lesion for Number of Days of CVR, RVR, and CVR + RVR by Surgery Type.

No. of Days	No. of Responses											
	Subepithelial Lesions								Epithelial Lesions			
	Nodules		Polyps		Cysts		Reinke's Edema		Leukoplakia		Papilloma	
	Cold Knife	Laser	Cold Knife	Laser	Cold Knife	Laser	Cold Knife	Laser	Cold Knife	Laser	Cold Knife	Laser
<b>CVR</b>												
0–2	1	0	0	0	0	0	0	1	2	4	6	7
3–4	6	2	7	2	4	2	6	4	7	10	3	9
5–6	5	4	6	6	8	3	4	3	7	5	3	3
7	13	5	16	6	16	6	13	12	4	5	5	5
8–14	1	1	2	1	2	0	0	0	0	0	0	0
Total no.	26	12	31	15	30	11	23	20	22	24	17	24
<b>RVR</b>												
0–2	0	0	0	0	0	0	0	0	1	2	4	5
3–4	0	0	1	0	0	0	1	2	5	8	2	5
5–6	1	0	1	0	1	0	0	1	0	1	0	0
7	10	5	11	6	11	5	6	7	5	4	4	4
8–35	8	5	11	6	11	5	10	8	8	7	5	8
Total no.	19	10	24	12	23	10	17	18	19	22	15	22
CVR + RVR	0 responses											

The largest response for each lesion is italicized.  
CVR = complete voice rest; RVR = relative voice rest.

less than 7 days of VR or more than 8 days of VR, and some providing a range of days, these responses were grouped. A generalized mixed models analysis revealed a significant difference ( $F = 19.6$ ,  $df = 1$ ,  $P < .0001$ ) between the number of days of VR recommended for subepithelial lesions (nodules, cysts, polyps, and Reinke's edema) and epithelial lesions (leukoplakia and papilloma). Given that  $df = 1$ , the directionality is determined on the descriptive statistics and indicates that VR recommendations of 7 days for subepithelial lesions and 1 to 4 days for epithelial lesions are the more common recommendations amongst laryngologists.

**Surgery and lesion type as factors.** Respondents, who previously selected lesion with surgery type to be factors in their decision for prescribing number of days and type of VR, then provided number of days of CVR or RVR they recommend for each surgery type and lesion (Table III). There were no significant statistical differences in the number of days recommended between cold-knife and laser surgery for CVR ( $F = 0.853$ ,  $P > .1$ ) or RVR ( $F = 0.547$ ,  $P > .1$ ). Similar to the responses in the previous section on lesion type, the largest number responded with 7 days of CVR for nodules, cysts, polyps, and Reinke's edema, 3 to 4 days for leukoplakia, and 0 to 2 days for papilloma. The largest number responded with recommendations for more than 8 days of RVR for all benign lesions except for leukoplakia with laser (3 to 4 days).

**Surgery or lesion type not factors.** The remaining participants that do not vary number of days of VR by lesion or surgery type had a lot of variability in the type and dosage of VR chosen. Three participants

recommend 7 days of CVR only. Four other respondents recommend 3, 5, 7, or 10 days of RVR only. Twenty one participants recommend CVR + RVR. Although there was no consensus on the dosage, the largest number of respondents recommend 7 days of CVR + 14 days of RVR (four respondents) or 7 days of CVR + 7 days of RVR (four respondents). CVR ranged from 2 to 7 days and RVR ranged from 3 to 35 days in this combination for the remaining 13 respondents.

### Ranking Factors

Participants were asked to rank, on a scale of 1 to 5, lesion type, patient compliance, degree of surgical dissection, type of phonosurgery, and any other factors used to determine CVR or RVR for a patient (Fig. 2). Degree of surgical dissection was the most important factor in this decision followed by lesion type and type of phonosurgery. Patient compliance was overwhelmingly ranked at 4 by 58.2% of respondents, denoting it as the least important of the four factors when choosing type of VR. Some participants stated location of the lesion, included in the category of other factors, as playing an important role in this decision.

### Other Considerations

Participants were asked if they provided recommendations for heavy lifting, exercise, diet, hydration, and, antireflux medications (Fig. 3). Three percent of the laryngologists refer their patient to a voice therapist post-surgery, 44.78% refer their patients for voice therapy

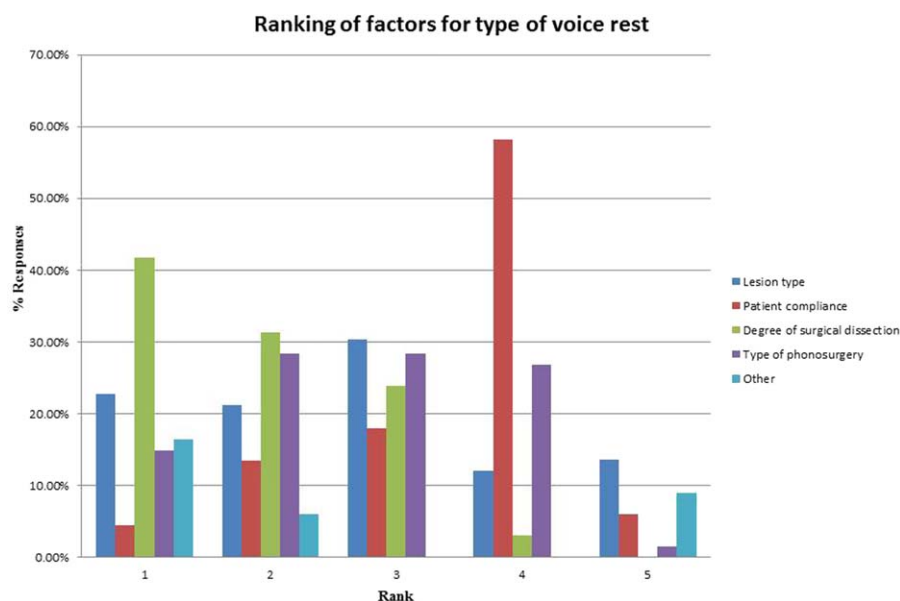


Fig. 2. Ranking of lesion type, patient compliance, degree of surgical dissection, type of phonosurgery, and other for recommendations of voice rest. [Color figure can be viewed in the online issue, which is available at [www.laryngoscope.com](http://www.laryngoscope.com).]

both pre- and postsurgery, but a majority of laryngologists in this study (52.24%) decide the time of recommending voice therapy (pre- and/or postsurgery) based on the lesion type. Laryngologists provide patients with instructions about voice care verbally prior to surgery (94.03%) and postsurgery (76.12%), and in writing prior to surgery (61.19%) and postsurgery (70.15%).

## DISCUSSION

Laryngologists who participated in this study had varying levels of experience and worked in a variety of settings across the United States. In 2003, Behrman and Sulica<sup>7</sup> found approximately half of their respondents

recommended VR. Although their study was completed by otolaryngologists and not laryngologists alone, in the current study close to 100% of the respondents recommend VR in their patients. Although there is a difference of 12 to 15 years between the two studies, there is a significant mismatch between the recommendations of the two groups that needs to be examined further.

For this group, type of phonomicrosurgery in itself, cold knife or laser, did not play a role in the decision for recommending dosage or type of VR. There were no significant differences for surgery type for CVR or RVR, further validating that surgery type alone does not play a role in VR recommendations. However, some respondents reported surgery with lesion type as factors in their

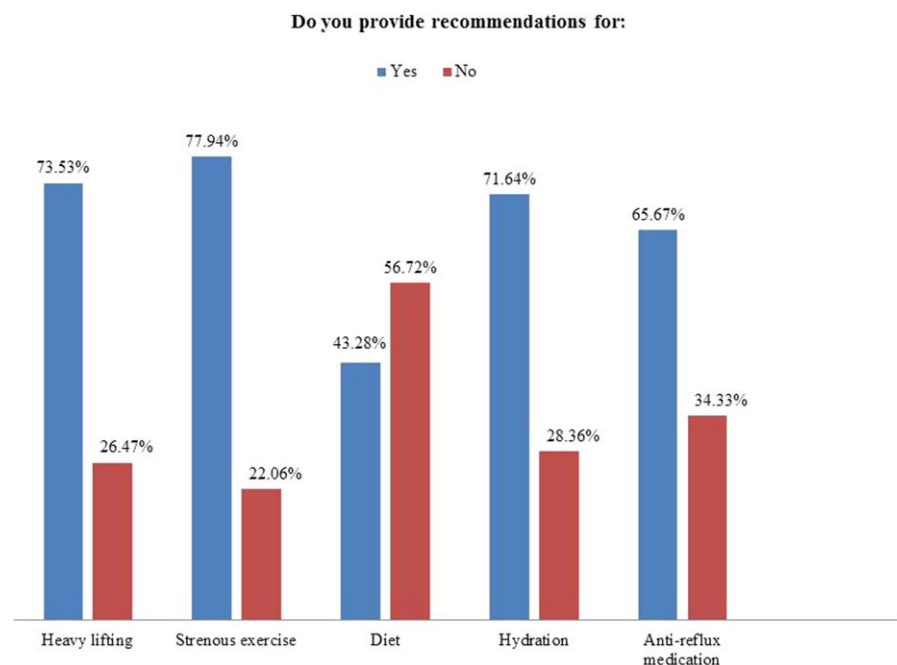


Fig. 3. Percentage of laryngologists that provide or do not provide recommendations for heavy lifting, strenuous exercise, diet, hydration, and antireflux medications. [Color figure can be viewed in the online issue, which is available at [www.laryngoscope.com](http://www.laryngoscope.com).]



decision making. For the benign lesions studied, the dosage and type of VR were consistent for nodules, cysts, polyps, and Reinke's edema (7 days CVR, 8 + days RVR) with differences in recommendations for leukoplakia (3–4 days CVR, 8 + days RVR) and papilloma (0–2 days CVR, 8 + days RVR for cold-knife surgery and 0–2 days CVR, 3–4 days RVR for laser surgery).

Mechanical injury during phonomicrosurgery disrupts the cellular structure of the epithelium, basement membrane and lamina propria. The extent of the disruption is dependent on the size of the lesion and surgical incision. Normal vocal fold wound healing process includes the phases of inflammation, extracellular matrix (ECM) deposition and epithelialization, and remodeling.<sup>6</sup> Hemostasis/coagulation occurs for the initial 24 hours, but inflammation continues for up to a week. Proliferation of fibroblasts of the ECM occurs approximately 3 days after injury.<sup>2,11</sup> Fibroblasts are important in the wound healing process, and early recruitment of these cells is key to recovery.<sup>4</sup> Voicing in the initial 48 to 72 hours may not aid healing in the absence of the fibroblasts, but can increase inflammation. Incomplete recovery of the disrupted tissue can lead to scarring, which significantly reduces the pliability and in effect the vibratory features of the vocal folds.

Evidence from the orthopedic literature supports the recommendation of exercise and voice use in the acute recovery phase. Even though extensive mobilization is detrimental, controlled remobilization in the early postoperative phase has been shown to aid functional recovery.<sup>20,21</sup> Animal studies in canine, rabbit, sheep, and rat models are ongoing to examine the process and duration of wound healing.<sup>3,5,6,22</sup> Rabbits with scarred vocal folds from forceps biopsy had increased stiffness and viscosity from disorganized collagen scaffolding in the ECM.<sup>6</sup> Rousseau et al.<sup>5</sup> used a rabbit model to quantify degree of epithelial surface damage after acute phonotrauma while manipulating time and magnitude of the vibratory doses between rabbits. They found a higher risk for inflammation and infection with continued vibration after the destruction of the basement membrane. In this situation, it would be advantageous to implement vocal rest to allow for recovery. Cho et al.<sup>3</sup> performed phonomicrosurgery in a canine model and severed the recurrent laryngeal nerve in one group to simulate VR. In the absence of voicing, the dogs had faster recovery of the basement membrane and cover of the vocal folds at 8 weeks than the normally phonating group, highlighting the benefit of VR. Given the recent data on wound healing in animal studies and orthopedic literature, CVR is essential to adequate recovery, but current proponents of early phonation recommend CVR for 3 days followed by easy vocalization.<sup>14</sup>

A large number of the practitioners in this study prefer 7 days of CVR for the localized lesions of the vocal fold cover but recommend less than 4 days of CVR for leukoplakia and papilloma. Degree of surgical dissection was ranked as the most important factor when deciding type and dosage of VR.

## Limitations

This survey study had a good response rate but had a smaller focus group (only laryngologists), leading to a smaller sample size compared to the Behrman and Sulica study.<sup>7</sup> The survey questions did not include degree of surgical dissection as a variable in the decision-making process for duration and type of VR.

## CONCLUSION

VR recommendations vary, but 7 days of CVR (range, 0–14 days) is the more common recommendation for localized benign lesions, whereas 1 to 4 days (range, 0–7 days) of CVR is prescribed for leukoplakia and papilloma. RVR, when prescribed, is typically recommended for over 8 days (range, 0–35 days). CVR is recommended more often than RVR in nodules, cysts, polyps, and Reinke's edema, whereas CVR, RVR, and CVR + RVR are used for leukoplakia and papilloma. Decisions for type and dosage of VR are made based on lesion type, with the surgical procedure implemented. Clinical outcome studies are now required to validate the VR recommendations to set up a standardized protocol that can be implemented postoperatively.

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