

The Effect of Short Duration vs Long Duration Voice Rest on the Outcome of Phonosurgery for Benign Vocal Fold Lesions: A Pilot Study

Jijo George¹, Unnikrishnan Menon², Archana M Varghese³

ABSTRACT

Background: Patients with benign vocal fold lesions often present with hoarseness. The mainstay of treatment is precise excision, termed phonomicrosurgery, and voice rest is recommended afterward to promote wound healing and better voice outcomes in the postoperative phase. However, there is no general consensus among the clinicians about the type and duration of voice rest needed. This study is an initial attempt to compare the effect of strict voice rest of short duration (1 day) vs long duration on the voice outcome postsurgery.

Materials and methods This being a pilot study, 10 patients undergoing phonomicrosurgery for benign vocal fold lesions, were chosen. They were alternately divided into two groups of short duration and long duration strict voice rest. Five patients were advised to follow 1 day's strict voice rest and other five, 7 days' voice rest. Pre and postoperative voice parameters of each patient were recorded, analyzed, and compared. To compare the pre and postchanges of voice parameters, Wilcoxon signed-rank test was applied and to compare the median difference of numerical variables between groups, Mann-Whitney *U* test was applied.

Results: While comparing the difference in voice parameters between the preoperative and postoperative periods in each group separately, almost all voice parameters showed statistically significant association. However, when comparing the changes between the groups, Voice Handicap Index (VHI) score was the only voice parameter which showed significant association (*p*-value 0.047).

Conclusion: In this pilot study, voice rest has positive impact on voice outcome postsurgery; and longer duration of absolute voice rest was found to give more subjective satisfaction regarding voice quality, based on the VHI score.

Keywords: Benign vocal fold lesion, Hoarseness, Phonomicrosurgery, Voice rest.

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INTRODUCTION

Voice and speech hold paramount importance in day-to-day human life. Besides, for many of us, our voice is also a source of income. As such, it is an indispensable human function, the disturbance or loss of which can have serious negative effects on human psyche and lifestyle.

Voice and speech dysfunction involves a spectrum of symptoms and diagnoses. Hoarseness is one of the commonest symptoms encountered which is perceived as rough, harsh, or breathy quality to the voice.¹ This can be as perceived by the patient and/or others in the range of communication. Benign lesions of vocal fold, which is one of the leading causes of hoarseness often requires surgery as its definite management.

Phonomicrosurgery is the term given for the precise excision of benign mass lesions of the vocal fold, most commonly polyps and cysts. According to the literature, voice rest of 3–7 days is generally recommended postsurgery to promote healing and better voice outcome.^{2,3} However, there is no consensus among phono surgeons and voice pathologists regarding the optimal type and duration of voice rest required. On the contrary, many experts in the field are suggesting no voice rest at all, drawing parallels with other areas of surgery where immediate postoperative rehabilitation is the new norm. There is also the issue of adequate patient compliance for a longer duration of absolute voice rest. Therefore, the endeavor is to prescribe the minimum needed that is most effective for vocal fold healing. The latter is a gray area as there is no method of studying the actual healing process *in vivo*. In this study, we have studied and compared the effect of strict

^{1,2}Department of Otorhinolaryngology, Amrita School of Medicine, Amrita Vishwavidyapeeth, Kochi, Kerala, India

³Department of Speech Pathology and Audiology, Amrita Institute of Medical Sciences, Kochi, Kerala, India

Corresponding Author: Unnikrishnan Menon, Department of Otorhinolaryngology, Amrita School of Medicine, Amrita Vishwavidyapeeth, Kochi, Kerala, India, Phone: +91 9447831755, e-mail: unnikrishnanmenon8@gmail.com

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voice rest of both short duration (1 day) and long duration (7 days) on voice outcome postphonosurgery for benign lesions of the vocal fold, in a small cohort of patients with the intention of doing a pilot in this area of research.

MATERIALS AND METHODS

This was a prospective comparison study done for a period of 1 year from August 2019 to August 2020. It was conducted in the Department of Otorhinolaryngology along with the Department of Speech Pathology and Audiology. Institutional protocol committee and ethics committee approvals were obtained.

Selection and Description of Participants

All patients 18 years and above, presenting with voice disorder and on examination were found to have benign vocal pathology (cyst, polyp, and sulcus), with an indication for surgery were included in this study. Those patients with malignant laryngeal lesions or with a history of previous phonosurgery were excluded from the study.

Since there are no previous studies in literature pertaining to this topic, it was planned to be a pilot study with sample size of 30 patients, divided into two groups of 15 each. This was based on observation in an earlier publication by Kiagiadaki et al.³ However due to certain technical issues and as per availability, we complied with a sample size of 10 patients fulfilling both exclusion and inclusion criteria.

Technical Information

The primary objective of the study was to study the effect of short duration (1 day) vs long duration (7 days) strict voice rest on the outcome of phonosurgery for benign laryngeal lesions. And the secondary objective was to study the association between age, sex, voice profession, lesion type, reflux, smoking, preoperative speech therapy, and voice abuse on voice outcome postsurgery.

Patients presenting with hoarseness undergo protocol-based evaluation in Ear, Nose, and Throat Outpatient Department and voice clinic (video laryngostroboscopy and perceptual voice analysis). They were also administered VHI questionnaire. Those diagnosed with benign lesions of vocal cord (cyst, polyp, and sulcus) were counseled for laryngeal surgery and strict voice rest thereafter. The surgeon was blinded to the voice rest period to which the patients were prescribed. The resident doctor in the surgical team, alternatively assigned each group I (1-day strict voice rest) and group II (7-day strict voice rest). The vocal cord lesion was operated and was sent for biopsy confirmation.

They were followed up in voice clinic after 1 month post-treatment, and evaluated with VHI score, video laryngostroboscopy, and acoustic analysis, and the findings were documented.

The documented voice parameters included maximum phonatory duration (MPD in seconds), contact quotient (CQ), acoustic analysis of the voice signal [fundamental frequency range (F0 range, Hz)], jitter (%), shimmer (%), perceptual grading with the Grade, Roughness, Breathiness, Asthenia, Strain scale, and self-evaluation with the Malayalam version of the VHI.

- **Voice Handicap Index:** It is a self-report questionnaire with series of 30 questions divided into three subscales of 10 each, analyzing the functional, organic, and emotional aspects of voice disorders.
- **Maximum phonatory duration:** It is a simple and easily measurable parameter of voicing; and is defined as the maximum time measured in seconds for which one can sustain a vowel sound produced on one deep inhalation at a relatively comfortable pitch. Normal values for MPD in adults range between 25 and 35 seconds for males and between 15 and 25 seconds for females. Maximum phonatory duration values vary with age.

Maximum phonatory duration values invariably get reduced in cases of vocal fold dysfunction or a laryngeal lesion and thus, is an indicator of laryngeal pathology. It also helps to monitor the progress with the proposed line of treatment.

- **Grade, roughness, breathiness, asthenia, strain scale:** It is the auditory perceptual evaluation method of hoarseness of voice; which gives scores of 0, 1, 2, or 3 for grade of hoarseness,

roughness, breathiness, asthenia, and strain (0—normal, 1—slight degree, 2—medium degree, and 3—high degree).

- **Fundamental frequency:** It is the lowest periodic component of vocal fold vibration, which is perceived as pitch. Fundamental frequency is reported in Hz as an indication of the number of cycles per second of the vibratory pattern.
- **Perturbation (jitter and shimmer).**

Jitter: It is the measure of perturbation, which is the cycle-to-cycle variation of F0. Even a subtle variation in vocal fold vibration can bring up changes in jitter.⁴

Shimmer: It is another component of measure of perturbation, which refers to the small, rapid, cycle-to-cycle variation in the amplitude. Slightest difference of mass, tension, biochemical characteristics, and neural control over vocal folds can be reflected in shimmer.⁴

- **Contact quotient:** It is the measure of degree of vocal fold approximation during phonation. It is expressed in percentage of cycle.

Statistical Analysis

The data were made into a master chart in Microsoft Excel 2010 and statistical analysis was performed using IBM SPSS 20 (SPSS Inc., Chicago, USA). For all the continuous variables, the results are given in mean \pm standard deviation (SD), median [interquartile range (IQR)], and for categorical variables as percentage. To test the statistical significance of the association of categorical variables between groups, Chi-square with Fisher's exact test was applied and to compare the median difference of numerical variables between groups, Mann-Whitney *U* test was applied. To compare the pre and postchanges of voice parameters, Wilcoxon signed-rank test was applied. A *p*-value <0.05 was considered as statistically significant.

RESULTS

A total of 10 patients who were electively operated upon for benign vocal fold lesions were included in the study. They were categorized into two groups of short (group I, 1 day) and long duration (group II, 7 days) strict voice rest fulfilling both exclusion and inclusion criteria. The mean age in group I and group II were 37.6 (10.3) and 51 (12.8), respectively. Out of five patients in group I, two (40%) were males and three (60%) were females; whereas four (80%) were males and one was female (20%) in group II. With a *p*-value of >0.05 , we concluded that patient demographics did not show significant difference between the groups. While examining the effect of secondary factors on voice outcome, the Chi-square test did not reveal significant difference between the frequency of sex, type of lesion, voice profession, reflux, vocal abuse, or preoperative speech therapy between the two groups (Tables 1 and 2).

Each patient enrolled in the study, who underwent phonosurgery was later advised strict voice rest thereafter. All of them completed detailed voice analyses in their pre and postoperative phase. While comparing the pre and postoperative voice parameters within each group we found that all patients showed significant improvement in their postoperative phase with regard to each parameter (Table 3). And while comparing the difference in percentage change in voice parameters between the two groups, only VHI showed statistically significant association (Tables 3 and 4).

Table 1: Patient characteristics

	Group I, n (%)	Group II, n (%)	p-value
Professional voice usage	1, (20)	4, (80)	0.206
Smoking	2, (40)	2, (40)	1.000
Reflux (GERD)	2, (40)	2, (40)	1.000
Vocal abuse	5, (100)	5, (100)	
Preoperative speech therapy	5, (100)	5, (100)	

The effect of secondary factors like smoking, reflux, vocal abuse, and preoperative speech therapy did not show significant differences between the groups. This indicates equality of the groups and elimination of possible bias between them

Table 2: Distribution of vocal fold pathologies

	Vocal cord polyps, n (%)	Vocal cord cyst, n (%)	p-value
Group I (n = 5)	1, (20)	4, (80)	0.206
Group II (n = 5)	4, (80)	1, (20)	

The distribution of vocal fold pathologies did not show significant difference in voice outcome with p-value 0.206

Table 3: Pre and postoperative changes in voice parameters

Parameters	Mean (SD)			
	Group I—pre	Group I—post	Group II—pre	Group II—post
VHI	75 (7.537)	56.2 (3.633)	67.8 (16.649)	40.4(18.461)
MPD	7.8 (0.447)	10.4 (0.894)	8.2 (3.194)	13.4 (2.074)
Jitter (%)	0.420 (0.060)	0.114 (0.108)	0.770 (0.588)	0.416 (0.332)
Shimmer (%)	4.758 (0.333)	2.584 (0.364)	6.742 (2.89)	4.3 (1.78)
CQ	50.540 (15.720)	73 (18.358)	59 (9.110)	64 (16.5)
F0 (Hz)	160 (44.008)	181.4 (34.129)	165 (39.406)	173 (38.694)

The above table shows that each parameter recorded in the postoperative phase showed significant difference when compared to their preoperative period. The fall in VHI, jitter, and shimmer values, whereas the rise in MPD, CQ, and F0 values clearly indicates the positive impact of voice rest on voice outcome postsurgery. The postoperative VHI score (Table 3) in both groups showed moderate dysphonia; but resulted in a much lower value in group II (40) compared to group I (56) which could be considered as an element in favor of 7-day voice rest

Table 4: Comparison of percentage change of voice parameters between groups

	Groups, n = 5	Mean ± SD	Median (IQR)	p-value
VHI	I	25.27 ± 6.22	26.6 (12.05)	0.047
	II	42.8 ± 13.73	47.3 (25.03)	
Jitter (%)	I	72.6 ± 24.95	54 (45.73)	0.325
	II	49.04 ± 34.6	59.5 (62.64)	
MPD (s)	I	25.27 ± 6.22	26.6 (12.05)	0.105
	II	42.8 ± 13.73	47.3 (25.03)	
Shimmer (%)	I	45.3 ± 9.17	44.9 (15.25)	0.342
	II	33.6 ± 22.03	29.5 (41.14)	
F0 (Hz)	I	15.5 ± 13.32	13.7 (24.79)	0.251
	II	5.43 ± 2.86	4.84 (4.42)	
CQ	I	51.3 ± 46.61	28.57 (81.28)	0.117
	II	9.58 ± 18.03	12.9 (29.94)	

This table compares the percentage change in each acoustic parameter between the two groups and we found that the VHI score showed statistically significant association (p-value of 0.047)

DISCUSSION

The quality of voice is dependent on the integrity of the well-layered and complex structure of the vocal fold, as explained by the Cover-Body Theory of Hirano.⁵ Any pathology causing a change in any of these anatomical constituents of the vocal fold can affect its vibration pattern, resulting in dysphonia or hoarseness. Most commonly, these can be either functional (due to voice misuse or abuse) or structural (mass) lesions. Of the latter, polyps and cysts are the commonest. These are benign vocal fold lesions, requiring excision (surgery) as the definitive treatment modality. However, voice rest and voice therapy are also needed, pre and postoperatively. Literature gives evidence on the positive impact of voice rest on postoperative voice outcome. However, there are no contemporary studies that compare voice rest of a specific duration or type.

In the present study, the mean age in group I was 37 and in group II was 51. In group I, out of five subjects, two (40%) were males and three (60%) were females. In group II, out of five subjects, four (80%) were males and one (20%) was female. The association of gender between groups was not found to be statistically significant in our study (p -value 0.524). However, women have been found to experience vocal health problems more frequently than men, regardless of their occupation.⁶

Other secondary factors like smoking, lesion type, gastroesophageal reflux disease (GERD), and vocal abuse not only cause histologic (microscopic) alterations in the vocal fold epithelium but also affect the acoustic property of voice in long term. However, in our study, these factors did not show statistically significant association in either group.

Voice disorders are very common among professional voice users. Professional voice users include those whose profession demands frequent usage of voice, as part of their job requirement or a source of income. Examples include teachers, singers, politicians, bus conductors, priests, etc. Dysphonia can be a potential handicap for such individuals. They often require a combination of expiratory muscle strengthening exercise and voice therapy for better voice outcome postsurgery. In our study, the majority of subjects in longer duration voice rest group were professional voice users (80%) and expressed greater improvement as reflected by low VHI score, compared to the short duration voice group subjects.

While comparing the difference in voice parameters between the preoperative and postoperative periods in each group separately, almost all voice parameters showed statistically significant association. The mean MPD score in group I was 7.8 in preoperative period which improved to 10.4 after 1 month of postoperative phase; in group II the mean MPD of 8.2 improved to 13.4. The mean CQ values in group I showed improvement from 50 to 73 and in group II, 59 to 64. Similar results were observed with jitter, shimmer, VHI, and F0 values. These changes show the positive impact of voice rest on the voice outcome postsurgery; which in fact, is also supported by similar results from other literature reviews.^{2-4,7}

On analysis of the mean changes from "before to after" treatment between the two groups, VHI score was the only voice parameter which showed significant association (p -value 0.047). As far as the VHI scoring is concerned, we observed some quantitative differences. Postoperative VHI score in both groups showed moderate dysphonia, but resulted in a higher average value in group I (56) compared to group II (40) which could be considered as an element in favor of 7-day voice rest. This indirectly showed that even though both the groups showed improvement with their VHI scores, it was group II subjects who were satisfied with their

voice outcome. The higher VHI scores in short duration (1 day) voice rest group could be due to the uncontrolled voice usage or vocal abuse similar to the preoperative period, which, in turn, is associated with higher incidence of prolonged dysphonia. In a randomized prospective study by Kiagiadaki et al., comparing 5- and 10-day voice rest, the VHI score in the postoperative period showed more improvement in the 5-day voice rest group.³ Absolute voice rest for prolonged period when compared to shorter periods did not show additional benefits, and moreover, it left the subjects irritated and less compliant in their daily works, leaving them socially isolated.

Voice pathologists involved in voice rehabilitation commonly accept that uncontrolled phonation in the postoperative period delays wound healing. However, there are no reported studies concluding whether prolonged voice rest hinders functional recovery.

Currently, there is a lack of prospective studies with objective outcome measures that may provide more information on the functional outcome, based on voice rest duration. The challenge in designing such clinical studies lies in multiple variables ranging from patient susceptibility to scarring, lesion type, surgical technique, degree of surgical injury, type of voice rest, and compliance. These factors have to be further investigated both clinically and biologically.

Limitations

The main limitation of the study was the small sample size. However, the idea being that of a pilot, we hope to add sufficient numbers to check the statistical power of the study. Also, multiple types of benign lesions were included in the study.

CONCLUSION

Voice rest has positive impact on voice outcome postsurgery. The longer duration of absolute voice rest was found to give more subjective satisfaction regarding voice quality, based on the VHI score. Patient compliance played a major role in adhering to the prescribed voice rest duration. This could be improved by counseling regarding controlled voice usage and preoperative voice therapy by a trained voice and speech pathologist. Similar study with bigger numbers and reinforcing the importance of absolute voice rest after phonosurgery could be recommended.

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