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Seven Days of Voice Rest Post-phonosurgery Is Not Better than 3 days: A Prospective Randomized Short-term Outcome Study

Liat Voloch, BSc; Michal Icht, PhD; Boaz M. Ben-David, PhD; Narin Nard Carmel Neiderman, MD, MSc; Guy Levenberg, MD; Yael Manor, PhD; Dina Shpunt, BSc; Yael Oestreicher-Kedem, MD

Objective: The aim of the study is to compare the short-term effect of 7 versus 3 days of voice rest (VR) on objective vocal (acoustic) parameters following phonosurgery.

Methods: A prospective randomized study conducted at a tertiary referral medical center. Patients with vocal fold nodules, polyps, or cysts and scheduled for phonosurgery were recruited from the Voice Clinic. They were randomized into groups of 7- or 3-day postoperative VR periods and their voices were recorded preoperatively and at 4-week postoperatively. A mixed linear model statistical analysis (MLMSA) was used to compare pre- and postoperative jitter, shimmer, harmonic-to-noise ratio, and maximum phonation time between the two groups.

Results: Sixty-five patients were recruited, but only 34 fully complied with the study protocol, and their data were included in the final analysis (19 males, 20 females; mean age: 40.6 years; 17 patients in the 7-day VR group and 16 in the 3-day VR group). The groups were comparable in age, sex, and type of vocal lesion distribution. The preoperative MLMSA showed no significant group differences in the tested vocal parameters. Both groups exhibited significant ($p < 0.05$) and comparable improvement in all vocal parameters at postoperative week 4.

Conclusions: A VR duration of 7 days showed no greater benefit on the examined vocal parameters than the 3-day protocol 4-week postoperatively. Our results suggest that a 3-day VR regimen can be followed by patients who undergo phonosurgery without compromising the vocal results. Larger-scale and longer-duration studies are needed to confirm our findings.

Key Words: cyst, nodule, phonosurgery, polyp, voice rest.

Level of Evidence: 2

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INTRODUCTION

Vocal rest or voice rest (VR), defined as the process of resting the vocal folds by not speaking or singing, is a part of both nonsurgical benign vocal fold lesion (BVFL) management[1] and postoperative care. It is thought to reduce irritation of mucosal tissue, thus reducing inflammation, edema, and scarring, and potentially contributing to better voice quality following surgery.[2] VR may be partial or complete. Complete VR means avoiding any phonatory activity, such as speaking, whispering, or singing. Modified VR can be mildly or moderately restrictive: it entails speaking, if necessary, in a well-supported and soft (so-called "confidential") voice but avoiding speaking in a loud voice and singing. Most laryngologists recommend complete VR following phonosurgery.[3]

Although a protocol of VR is widely followed in clinical settings, its most effective duration is unknown and varies from 0 to 14 days between centers and otolaryngologists.[4–6] The most highly recommended vocal rest duration for individuals following phonosurgery is 7 days in the United States,[6] and 4 to 5 days in Europe.[5] The evidence in the literature on the optimal duration of VR and its contribution to overall postoperative voice quality is also mixed. Several studies have indicated that a longer VR duration results in better outcomes than a shorter one. One study by Kiagiadaki et al.[7] showed a benefit of prolonged voice rest (10 days) relative to a shorter rest (5 days) on maximum phonation time (MPT). Other studies reported the opposite trend, with better outcomes following shorter VR durations. Kaneko et al.,[8] for instance, measured voice outcomes in patients at 1, 3, and 6 months postoperatively, and these

From the Department of Communication Disorders (L.V., M.I.), Ariel University, Ariel, Israel; Baruch Ivcher School of Psychology (B.M.B.-D.), Reichman University (IDC), Herzliya, Israel; Department of Speech-Language Pathology (B.M.B.-D.), University of Toronto, Toronto, Ontario, Canada; Toronto Rehabilitation Institute (B.M.B.-D.), University Health Networks (UHN), Toronto, Ontario, Canada; Department of Otolaryngology-Head and Neck Surgery and Maxillofacial Surgery (N.N.C.N., G.L., Y.O.-K.), Tel Aviv Sourasky Medical Center, Faculty of Medical and Health Sciences, Tel Aviv University, Tel Aviv, Israel; Movement Disorders Unit, Neurology Department (Y.M., D.S.), Tel Aviv Sourasky Medical Center, Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel; and the Faculty of Health Professions, Communication Sciences and Disorders Department (Y.M.), Ono Academic College, Kiryat Ono, Israel.

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Liat Voloch and Michal Icht contributed equally to this study.

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Send correspondence to Yael Oestreicher-Kedem, Department of Otolaryngology-Head and Neck Surgery and Maxillofacial Surgery, Tel Aviv Sourasky Medical Center, Faculty of Medicine and Health Sciences, Tel Aviv University, Tel Aviv, Israel. Email: yaeloe@tlvmc.gov.il

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authors found that 3 days of VR (followed by voice therapy) led to better outcomes in terms of normalized mucosal wave amplitudes compared to 7 days of VR. Other studies indicated no differences in postoperative voice outcomes between patients after a short duration of VR or no VR and after a long duration of VR (no VR vs. 7 days of VR).[9–11]

A recent meta-analysis pointed to the potential negative effects of long VR duration (>7 days) on patients' compliance and quality of life.[12] Another study showed an adverse effect of VR on patients' communication efficiency as well as on their quality of life and their ability to resume work.[13] Their patients reported feeling frustrated and handicapped while on VR.

The current study addressed this controversial issue, aiming to determine whether there was a difference in postoperative voice quality between 3 and 7 days of VR following phonosurgery undertaken for three selected BVFLs (nodules, polyps, and cysts) in the short-term.

Our decision to compare voice quality at these two specific time points was based upon several parameters. The customary period of VR in our institute during the last decade had been 5 days, and so we now selected 3 and 7 days of VR to make a clear-cut distinction. The choice also considered patient convenience: employees are allowed compensated sick leave if they present authorization from their primary care physician (which they can obtain online) without needing an in-person clinic visit providing that the request for leave is for no longer than 3 days. Finally, the postoperative 3-day period covers the maximal inflammatory phase of wound healing as well as being a period when large amounts of reactive oxygen species are produced (4). Therefore, we considered that resting the vocal folds for 3 days will help avoid additional tissue damage caused by reactive oxygen species.

MATERIALS AND METHODS

Study Design and Setting

This randomized prospective study was conducted at a tertiary referral medical center in Israel between April 2019 and September 2023. The study was approved by the institutional review board (Helsinki Committee, 0372-18-TLV). All participants provided informed consent.

Study Participants

The participants were recruited from the Voice Clinic. Adult non-pregnant individuals (>18 years of age) scheduled to undergo phonosurgery for vocal fold polyps, cysts, or nodules were invited to participate in the study. Patients with a history of laryngeal malignancy, treatment of laryngeal malignancy, or radiotherapy to the head and neck were excluded. Those who agreed and provided written consent to participate were recruited. The data of patients who underwent phonosurgery, had intraoperative confirmation of a vocal fold cyst, polyp, or nodules, complied with the assigned VR protocol, and attended the 4-week postoperative follow-up visit were included in the final analysis. Excluded were patients who: (a) voluntarily withdrew from the study, (b) were diagnosed intraoperatively with a vocal fold lesion other than cyst, polyp, or nodules (e.g., tumor, subepithelial edema, leukoplakia, papilloma, etc.), (c) failed to attend the 4-week postoperative clinic visit, or (d) failed to comply with the scheduled VR assigned to them (3- or 7-day VR period).

Procedures

Patients enrolled in the study were randomized to the 3-day or the 7-day VR groups. Preoperatively, the patients underwent flexible fiberoptic examination of the vocal folds and voice recording. These evaluations were repeated at the scheduled 4-week postoperative visit. Perceptual voice assessment was performed preoperatively by means of the GRBAS scale[14] and the sum of values (0—normal, 1—slight, 2—moderate, or 3—severe dysfunction) of each component was calculated for each patient. The self-reported talkativeness scale[15] was used to record the patients' talkativeness (a 1 to 7 scale; 1 represents a quiet untalkative person, 4 represents an averagely talkative person, and 7 represents an extremely talkative person) preoperatively. Compliance with the assigned VR period was confirmed by interviewing the patient in person at the 1-week postoperative clinic visit and again at the 4-week postoperative visit. Self-reporting noncompliant patients were excluded from the study. Phonosurgery was performed under general anesthesia and the laryngeal lesions underwent cold knife microdissection. All cysts and nodules were resected through epithelial cordotomy and subepithelial resection of their content. Polyps were excised either, via epithelial cordotomy and subepithelial resection of the polyp content or, less commonly, through amputation when pedicled on a narrow base. All resections were superficial to the vocal ligament. No steroid injections or other treatments were added.

After surgery, the patients were granted 2 weeks of sick leave. They received both oral and written instructions to use their voice cautiously following the assigned vocal rest period. Specifically, they were advised to avoid shouting, screaming, whispering, and singing aloud, as well as to avoid intensive throat clearing. Compliance with these instructions was verified during the follow-up visit. However, we did not objectively measure the amount of voice used during the period between the completion of the VR and the 4-week recording. Additionally, none of the patients received voice therapy during the 4-week postoperative period.

Acoustic Analysis

Each participant's voice was recorded preoperatively and at the 4-week follow-up visit. The recordings were performed in a quiet room using the SHURE PGA48 microphone and the Audacity® software. The microphone was held at 1–2 cm from the subject's mouth. The voice recording was carried out at comfortable loudness and pitch levels, and the protocol included phonation of/i/for 5 s twice, phonation of/a/for 5 s twice, and phonation of/i/for as long as possible three times. Acoustic analysis was performed with the Praat software version 6.2.01. The following voice indices were extracted: fundamental frequency (f0), maximum phonation time (MPT), jitter, shimmer, and harmonic-to-noise ratio (HNR).[16]

Statistical Analyses

For pre- to postoperative group comparisons, we used Mixed Linear Modeling (MLM) (SPSS Statistics 28), with group (VR period, X2: 3 days vs. 7 days), sex (X2: male vs. female), and pathology (X3: nodule, polyp, or cyst) as between-participant variable and time point (X2: pre- and 4-week postoperative) as a within-participant variable. The reference values were 3 days, female sex, nodule, and preoperative. Each test included its

respective dependent variable and between-participant variable(s). A nonparametric Mann–Whitney U test was used for preoperative talkativeness and GRBAS scores comparisons. All statistical tests and/or confidence intervals, as appropriate, were performed at $\alpha = 0.05$ (two-sided).

RESULTS

Patients

A power analysis indicated that a sample size of at least 30 participants is required to achieve a power of 0.95 to detect a medium-small effect size ($f^2 = 0.35$, $\eta_p^2 \sim 0.1$, a conservative estimate).[17] Anticipating a high degree of follow-up attrition, a sample of convenience consisting of 65 patients was recruited. Of them, 32 were excluded from the study due to either failure to attend the 4-week follow-up visit ($n = 13$ of whom eight were from the 7-day VR group and five from the 3-day VR group), missing recordings ($n = 3$; all from the 3-day VR group), having been diagnosed on direct laryngoscopy with other (granuloma, subepithelial edema, and carcinoma leukoplakia) than the three pathologies selected for this study ($n = 13$), or failure to fully comply with the assigned VR protocol ($n = 3$; two from the 3-day VR group and one from the 7-day VR group). Thirty-three patients (14 males, 19 females, mean age 40.6 years, range 20–75 years) fulfilled the study entrance criteria and their data were included in the final analysis. Their demographic data and laryngeal findings are presented in Table I. Sixteen patients completed 3 days of VR and 17 completed 7 days of VR. There were no preoperative group differences in sex distribution ($p = 0.58$), age ($p = 0.14$), preoperative GRBAS sum score ($p = 0.23$), talkativeness score ($p = 0.38$), and laryngeal findings ($p = 0.66$).

Fundamental Frequency

A summary of the fundamental frequency results is presented in Table II. As expected, females had significantly ($p < 0.001$) higher mean F0 values than males at all time points and in both VR groups. The mixed linear model statistical analysis (MLMSA) showed that neither the time point nor the VR duration nor their interaction had any significant effect on F0 (all $p > 0.15$; Table III). Similarly, type of pathology and age did not have any significant effect on F0 (all $p > 0.4$).

Mean Phonation Time, Jitter, Shimmer, and Harmonic-to-Noise Ratio

A full MLMSA (Fig. 1, Table III) showed a significant (all $p < 0.01$) positive effect of surgery on performance. The postoperative values in both the 3- and 7-day study groups improved in all measurements (Table II): those for jitter (3-day, males: 0.66 to 0.37, females: 0.61 to 0.37; 7-day, males: 0.52 to 0.35, females: 0.88 to 0.36) and shimmer (3-day, males: 4.46 to 1.5%, females: 4.44 to 1.93%; 7-day, males: 2.85 to 2.39%, females: 4.78 to 2.37%) decreased, while those for MPT (3-day, males: 9.72 to 16.93 Sec, females: 9.43 to 11.8 Sec; 7-day, males: 14.15 to 16.75 Sec, females: 9.9 to 14.65 Sec) and HNR (3-day, males: 21.41 to 25.06 dB, females: 20.6 to 26.27 dB; 7-day, males: 24.54 to 25.06 dB, females: 20 to 27.19 dB) increased. A comparison of the pre- and postoperative jitter, shimmer, HNR, and MPT of the two study groups revealed that the length of the VR period did not have a significant effect on performance (all $p > 0.25$) and did not significantly interact with the effect of time (all $p > 0.35$). Sex also had no significant effect on either of those measures (all $p > 0.15$). Age had a significant effect solely on jitter (increased values with aging), but not on any other parameter. The type of pathology had no significant effect on either of those measures (all $p > 0.05$).

As mentioned above, three patients reported that they did not fully adhere to the assigned VR protocol. In Appendix A1, the same MLM analysis is repeated with these three patients, demonstrating highly similar effects to those found in the primary analysis. Appendix A2 includes the demographics of those patients.

TABLE I.
Patient ($N = 33$) Demographics and Laryngoscopic Findings According to Study Group.

Variable	3-day voice rest group ($N = 16$)	7-day voice rest group ($N = 17$)	p-value
Sex (male, female)	6, 10	8, 9	0.58
Mean age, years (SE)	36.4 (12.9)	44.5 (17.1)	0.14
Mean talkativeness score (SE)	6.2 (0.3)	5.8 (0.3)	0.38
Mean preoperative GRBAS sum score (SE)	5.8 (0.5)	6.7 (0.7)	0.23
Laryngeal findings			
Nodules	3	5	0.66
Polyp	6	7	
Cyst	3	4	
Mixed	4	1	

GRBAS = grade, roughness, asthenia, breathiness, strain; Mixed = a combination of vocal fold polyp or cyst and a contralateral vocal fold nodule; Preop = preoperative; SE = standard error.

TABLE II.
Comparison of Preoperative and 4-week Postoperative Voice Analysis Results (Means, Standard Errors of Mixed Linear Modeling Estimates) of the Two Study Groups. Panel A: Data for Males; Panel B: Data for Females.

A: Males

	3-Day voice rest period		7-Day voice Rest period	
Voice parameter mean (SE)	Preoperative	4-Week postoperative	Preoperative	4-Week postoperative
Fundamental frequency, Hz	144.94 (7.21)	130.7 (13.21)	163.11 (22.58)	156.89 (17.24)
Jitter, %	0.66 (0.26)	0.37 (0.12)	0.52 (0.14)	0.35 (0.09)
Shimmer, %	4.46 (1.62)	1.5 (0.13)	2.85 (0.43)	2.39 (0.59)
Harmonic-to-noise ratio, dB	21.41 (1.88)	25.06 (1.62)	24.54 (1.64)	25.06 (1.69)
Maximum phonation time, sec	9.72 (1.63)	16.93 (2.36)	14.15 (1.73)	16.75 (2.32)

B: Females

	3-Day voice rest period		7-Day voice rest period	
Voice parameter mean (SE)	Preoperative	4-Week postoperative	Preoperative	4-Week postoperative
Fundamental frequency, Hz	206.26 (17.42)	232.07 (11.29)	233.99 (13.12)	227.82 (13.51)
Jitter, %	0.61 (0.12)	0.37 (0.04)	0.88 (0.28)	0.36 (0.05)
Shimmer, %	4.44 (0.98)	1.93 (0.42)	4.78 (1.73)	2.37 (0.43)
Harmonic-to-noise ratio, dB	20.6 (1.58)	26.27 (0.56)	20 (2.68)	27.19 (1.21)
Maximum phonation time, sec	9.43 (1.58)	11.8 (1.73)	9.9 (1.8)	14.65 (2.41)

SE = standard error.

TABLE III.
Full Multi Linear Model Statistical Analyses. The Asterisks (*) Represent Significant Effects.

	F0	Jitter	Shimmer	HNR	MPT
Rest duration	$F(1,28.075) = 1.072$, $p = 0.309$	$F(1,29) = 0.018$, $p = 0.895$	$F(1,29.949) = 0.008$, $p = 0.931$	$F(1,26.5) = 0.544$, $p = 0.467$	$F(1,26.983) = 1.327$, $p = 0.259$
Time	$F(1,30.731) = 0.141$, $p = 0.71$	$F(1,30.674) = 8.333$, $p = 0.007$*	$F(1,30.246) = 10.139$, $p = 0.003$*	$F(1,30.994) = 17.413$, $p < 0.001$*	$F(1,28.165) = 12.315$, $p = 0.002$*
Sex	$\beta = -71.253$ $F(1,27.326) = 17.363$, $p < 0.001$ *	$\beta = 0.343$ $F(1,24.046) = 0.043$, $p = 0.838$	$\beta = 1.449$ $F(1,23.844) = 1.861$, $p = 0.185$	$\beta = -3.904$ $F(1,25.374) = 1.169$, $p = 0.29$	$\beta = -3.484$ $F(1,26.732) = 1.511$, $p = 0.23$
Pathology	$F(2,26.765) = 0.385$, $p = 0.684$	$F(2,23.884) = 1.187$, $p = 0.323$	$F(2,23.607) = 3.147$, $p = 0.061$	$F(2,24.893) = 1.177$, $p = 0.325$	$F(2,26.571) = 0.29$, $p = 0.751$
Age	$F(1,28.772) = 0.71$, $p = 0.406$	$F(1,24.5) = 6.593$, $p = 0.017$*	$F(1,24.508) = 0.906$, $p = 0.35$	$F(1,26.707) = 0.009$, $p = 0.924$	$F(1,27.103) = 0$, $p = 0.994$
Rest duration time interaction	$F(1,30.75) = 1.977$, $p = 0.17$	$\beta = 0.006$ $F(1,30.652) = 0.269$, $p = 0.608$	$F(1,30.219) = 0.802$, $p = 0.378$	$F(1,30.972) = 0.195$, $p = 0.662$	$F(1,28.177) = 0.004$, $p = 0.947$

F0 = fundamental frequency; HNR = harmonic-to-noise ratio; MPT = maximum phonation time, β = beta coefficient.

DISCUSSION

The current study compared the postoperative outcomes of 3 days of complete VR with those of 7 days of complete VR on a variety of voice quality parameters. The overall results indicated significant improvement in all the measured voice parameters (MPT, jitter, shimmer, and HNR) following phonosurgery, irrespective of VR duration. These findings suggest that prolonging complete VR from 3 to 7 days does not confer additional benefits in terms of the voice quality parameters measured after phonosurgery for vocal fold nodules, polyps, or cysts.

The lack of differences in voice outcomes between the 3-day and 7-day VR groups is in opposition to some earlier evidence of better outcomes with longer VR periods. For example, Kiagiadaki et al.[7] demonstrated that extending the VR period to 10 days yielded advantages in MPT compared to a VR period of 5 days. One potential explanation lies in the type of vocal pathologies: whereas the current study focused specifically on BVFLs (nodules, polyps, cysts), other studies, Kiagiadaki et al.'s included,[7] covered a heterogeneous group of pathologies (e.g., Reinke's space edema, polyps, nodules, hyperkeratosis, cysts, sulcus, or combined lesions). Different pathologies may indeed warrant different VR durations, posing an important question for future research on multiple pathologies.

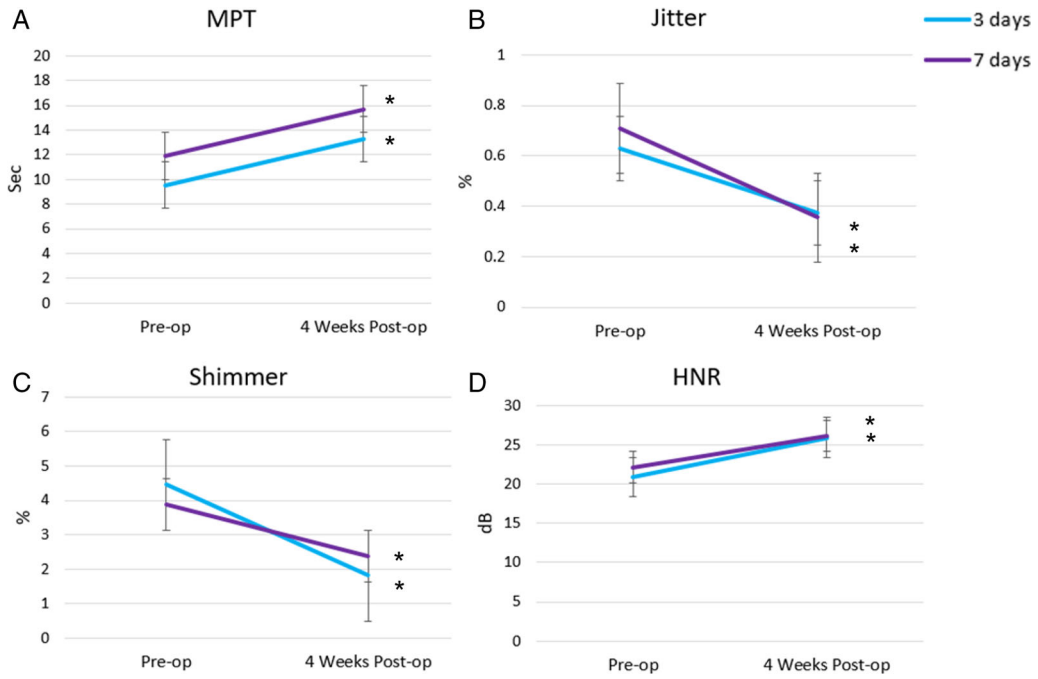

Fig. 1. The interaction between the main study voice parameters' results and time for the two study groups. (A). Maximum phonation time (MPT); (B). Jitter; (C). Simmer; (D). Harmonic-to-noise ratio (HNR); Pre-op = preoperatively; 4-week post-op = 4 week postoperatively; (*) = statistically significant ($p < 0.05$). [Color figure can be viewed in the online issue, which is available at www.laryngoscope.com.]

Although VR duration did not affect outcomes, significant improvements in voice quality were observed in the pre- and postoperative measurements in both groups, confirming the effectiveness of phonosurgery for improving voice quality in patients with vocal fold nodules, polyps, and cysts. This is consistent with prior evidence[18–20] that suggested that phonosurgery, irrespective of VR duration, may be the primary driver of improved postoperative voice production. In their study, which included patients who voluntarily chose between postoperative VR and no VR, Cohen et al.[9] recently found no differences between the groups in terms of postoperative shimmer, jitter, and HNR. A prospective randomized study that includes a no-VR group would be needed to confirm those observations.

Neither sex nor specific vocal pathology (nodules/polyps/cysts) had any significant effect on postoperative outcomes. The only demographic variable with any influence on voice quality parameters was age, which was related to higher (worse) jitter values. Similar findings were reported by Rojas et al.,[21] who aimed to enhance the understanding of vocal changes in adults over 50 years of age by considering both pathological and age-related factors. In their systematic review of 47 studies, older individuals were found to exhibit higher dysphonia scores, while one meta-analysis highlighted age-related variations in fundamental frequency and perturbation measures. This is in line with earlier evidence of age-related voice changes.[22]

Overall, a 3-day complete VR regimen appears adequate for optimizing patients' voice quality following BVFLs phonosurgery, at least in the short term (4-week postoperatively). From a clinical standpoint, restricting VR to 3 days should improve the patients' quality of life during the short-term postoperative period compared to longer VR, without compromising vocal outcomes. Compliance with absolute VR is difficult.[23,24] A brief period of VR bears fewer social, occupational, and emotional costs compared with longer periods of silence.[13] Initiating voice rehabilitation earlier may confer additional benefits by helping improve coordinated vocal fold function and prevent maladaptive compensatory behaviors.[11]

Our study has some limitations that warrant mention. It was conducted in a single center and our results may not represent other populations. Enrolment in the study was voluntary, and it is possible that more talkative patients were reluctant to participate in the study and possibly need to commit to a 7-day VR period. The study was conducted over a relatively long period (2019–2023) during which the COVID-19 pandemic erupted and disrupted the follow-up of patients and accounting, in part, for the high drop-out rate. In addition, compliance with the VR protocol was based solely on the patient's report. Moreover, the follow-up results covered only 4-week, a length of time in which wound healing, which may affect voice quality, is still in progress, a more extended follow-up would help determine whether the equivalent results for the two VR periods are sustained over a longer term. Finally, it would be more informative to also examine patient-reported indices such as VHI-10, as well as auditory perceptual voice quality evaluation measures, such as the GRBAS scale score in parallel with the presented acoustic measures. Other acoustic voice parameters, not measured in our study, may disclose an advantage for one of the tested VR periods over the other.

CONCLUSION

This randomized trial indicates that opting for a complete VR of 3 days over 7 days post-phonosurgery appears adequate for the included BVFLs. Maintaining VR for 7 days does not improve the objective voice quality parameters measured in this work at 4-week postoperatively. The short VR protocol reduces the patient's burden of keeping silent and facilitates earlier initiation of voice therapy which could optimize long-term recovery.

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