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Efficacy of the DoctorVox Voice Therapy Technique for the Management of Vocal Fold Nodules

Original Investigation

İlter Denizoğlu[1], Mustafa Şahin[2], Elif Şahin Orhon[1]

[1]Department of Otolaryngology, Vocology Unit, Medical Park İzmir Hospital, İzmir, Turkey
[2]Department of Otolaryngology, Aydın Adnan Menderes University Faculty of Medicine, Aydın, Turkey

Abstract

Objective: Vocal fold nodules (VFNs) are among the most common causes of dysphonia. Phonolaryngeal microsurgery, pharmacological treatments, and voice therapy (VT) have been used for treating VFNs. VT has been advocated as the primary treatment of choice. This study investigated the efficacy of the DoctorVox Voice therapy technique (DVT) for treating VFNs.

Methods: A total of 38 patients with VFNs and 40 individuals without any voice problem (control group) were included. All patients received the DVT program. Otorhinolaryngology examination, videolaryngostroboscopy (VLS), and acoustic analysis (SPL, mean F0, jitter %, shimmer %, NHR) were performed at pretreatment, one and six months after the end of treatment. The voice handicap index-10 (VHI-10) and the GRB scales were used for perceptual voice evaluation. GRB and VLS scorings were done blindly.

Results: Compared with the pretreatment values, the first- and the sixth-month values after treatment demonstrated a significant decrease in VHI-10 (19.5 vs. 5.1), GRB (2.3 vs 0.68 for G value) and VLS scores, SPL (54.4 vs 66.1 dB), F0 (201 vs. 227 Hz), jitter % (1.46 vs 0.85), shimmer % (3.27 vs 2.51), NHR (1.15 vs. 0.46) values among patients. Most of the voice parameters in the sixth month after the DVT program did not differ significantly from those of the control group.

Conclusion: The DVT was found to be an effective method in VFN treatment.

Keywords: Vocal folds, dysphonia, voice disorder, treatment outcome, laryngeal diseases, therapy

ORCID IDs of the authors:

İ.D. 0000-0002-9030-9479;
M.Ş. 0000-0002-9009-6389;
E.Ş.O. 0000-0002-8662-007X.

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Corresponding Author:
Mustafa Şahin
mustafa.kbb@gmail.com

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Introduction

Vocal fold nodules (VFNs) are benign lesions of the vocal folds (VF) caused by repetitive microtrauma to the vocal fold mucosa leading to histological changes and concomitant dysphonia (1). VFNs are common causes of hoarseness in the population and cause labor loss and deterioration in quality of life. The main symptoms are hoarseness, throat discomfort, and vocal fatigue (2). Vocal overuse, misuse, abuse, and imbalances/increases in laryngeal muscle tension were pointed out as the main causative factors (1,2). Non-voice-use-related causative factors could be laryngopharyngeal reflux, smoking, and allergy (2,3). VFNs are more commonly diagnosed in women in adulthood. VFNs are mostly seen in the mid-membraneous part of the VF mucosa where maximum impact stress occurs (3). Irregular closure of VFs creates valve inefficiency, and consequently, a compensatory reaction can cause hyperfunctional behavior in the supraglottic structures and extrinsic laryngeal muscles.

There is no Level 1 evidence as to which method is effective for treating patients with VFN (4). A Cochrane review reported evidence from non-randomized interventional studies (Levels 2-4) only (5). In daily clinical practice, most clinicians prefer voice therapy (VT) as the primary method (2,4). The evidence base for the effectiveness of VT is constantly evolving (4,6). Laryngeal microsurgery (LM) is considered in a limited number of selected patients and in patients that do not respond to VT (5). Different conservative approaches and VT techniques have been described in the literature. However, there is a lack of documentation on the efficacy of different VT techniques. Moreover, there are no algorithms or guidelines available that identify the optimal intensity or duration of VT for VFNs (6-9).

Phonation into resonance tubes is a method known since the 1960s when Professor Sovijärvi introduced glass tubes (10). Voice pathologist Sihvo presented the silicone tube with the LaxVox exercise. The DoctorVox voice therapy technique (DVT) was developed based on Sihvo's LaxVox tube exercise by Denizoglu et al. (11). It is a holistic approach and a direct method that changes the vocal mechanism. Artificially elongated vocal tract and backpressure are the main factors that intuitively balance simultaneous functions included in voice production. DVT is a multi-dimensional, multi-level treatment program (12). Three dimensions (clinician's action plan, exercise patterns, and monitoring) and four levels (preset, exploration, development, and adaptation) are distinguished through DVT practice (Figure 1). The effectiveness of DVT for the management of VFNs was evaluated for the first time in the literature in this study.

Methods

This study was conducted in a voice clinic of a university hospital and approved by the Institutional Review Board of the Local Ethics Committee of Aydın Adnan Menderes University (decision number: 2017/238). The initial examinations of the patients who had been referred to the vocology unit were performed by the same laryngologist and a routine follow-up form for patients with voice disorders was completed. This form includes the patient's demographic, medical, and voice habituation history, as well as vocal assessment, videolaryngostroboscopy (VLS), and voice analysis data.

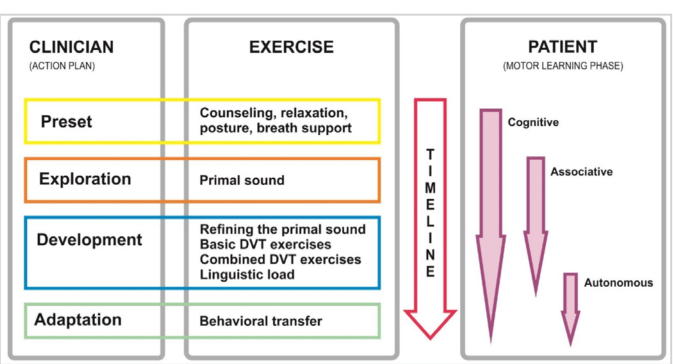

Figure 1. Three levels of DoctorVox voice therapy technique

Participants

Patients diagnosed with VFNs were informed about the disease and the available treatment methods for VFN. The exclusion criteria were: Age <18 years; presence of voice symptoms for less than three months; previous history of a medical condition causing dysphonia, such as neurological, psychiatric, respiratory, endocrine, or autoimmune diseases; history of previous LM, head and neck trauma, radiotherapy, chemotherapy, VT, or vocal training. Those who needed reflux treatment were not included in the study. Patients with any vocal fold pathologies other than VFNs such as vocal fold polyps, cysts, and sulcus vocalis found in the examination were excluded. Patients with irregular pre- and post-treatment follow-up visits, irregular attendance, and follow-up records were also excluded. 40 individuals without any voice problem (control group) were included. The control group was selected from volunteers over 18 years of age, who did not have any complaints about the voice, and whose otorhinolaryngology and voice examinations were normal, with age and gender distribution compatible with the nodule group. The same parameters as the nodule group were recorded

Outcome Measures

Voice-related data from the time of diagnosis, and one month and six months after the end of the DVT were analyzed. The same data was also obtained for the control group. All participants showed their professional voice use and vocal overuse on a 10-mm visual analog scale. The validated Turkish version of the voice handicap index-10 (VHI-10) was used for subjective self-reporting of the severity of vocal symptoms. GRB scale (a version of GRBAS) was used for auditory perceptual assessment. GRB is a reliable and valid scale consisting of three parameters (Grade, Roughness, Breathiness) on a scale of 0–3 (0 is normal, 1 is slight, 2 is moderate, and 3 is a high degree of severity) (13). Voice recordings were separately scored by two experienced otolaryngologists, GRB scorings were done blindly. A paragraph in Turkish composed of 219 words with rich and balanced phonemes was used to record speech. The compatibility between evaluators was analyzed before the study. The intraclass correlation coefficient for the interjudge evaluation was 0.82.

VLS (Karl Storz Pulsar GmbH&Co. KG, Tuttlingen, Germany) was performed to evaluate vocal fold movements and mucosal waveform pattern. The shuffled VLS recordings were separately analyzed by two experienced otolaryngologists. VF dynamics based on VLS were scored using the protocol of the European Laryngological Society.

The basic parameters of this VLS scale were glottal closure, regularity, mucosal wave, and symmetry. VLS was graded using a four-point grading scale (0= no deviance and 3= severe deviance, with 12 max total scores) (14). The compatibility between evaluators was analyzed pre-study. VLS scorings were done blindly and the intraclass correlation coefficient for the interjudge evaluation was 0.79.

Voice samples were recorded via a high-quality unidirectional condenser microphone (AKG, Vienna, Austria) in a sound-insulated room. Each patient was allowed a period to familiarize themselves with the text before recording. The subjects were instructed to phonate sustained vowel [a] at a habitual pitch and comfortable loudness. The task was repeated three times and each trial was captured on a hard disk at a 44.100-Hz sampling rate and 16-bit resolution. Dr. Speech (Tiger Electronics, Inc., WA, USA) software (Vocal Assessment, Real Analysis) for Windows (Version 4.30, MA, USA) was used to capture and analyze the voice samples. "The first and the last one second of the analyzed voice sample were excluded". The mean values were then calculated for each subject. Acoustic parameters, namely, mean fundamental frequency (F0), sound pressure level (SPL), jitter percentage (Jitt %), shimmer percentage (Shim %), noise-to-harmonic ratio (NHR) were obtained. Maximum phonation time (MPT) was measured three times and mean duration was noted.

Treatment

VT was performed by the same experienced phoniatrician. None of the patients were given pharmacotherapy.

The DVT procedure applied for VFNs was:

1. Counseling: The disorder was explained in detail. VLS images were shown and glottic closure was described.

2. Proper abdominodiaphragmatic breathing and posture were studied and using the DoctorVox device, the primal sound was explored (15).

3. Pneumophonic concordance was developed for the first few sessions with homework exercises at low pitches. When the appropriate glottic closure pattern was mastered by the patient with the primal sound, this vocal skill ~~is~~ was transferred to other tasks. The backpressure level was decided empirically between 3 and 7 cm H_2O. The intraoral air pressure was formerly measured by adjusting a pressure sensor (Keller PR-4, Winterthur Switzerland). The clinician increased the backpressure by water depth and the DC-Valve (which has been devised for DVT exercises) until a full chest sound was heard.

4. Treatment at the fourth DVT level was done in the clinic and at home both with reading-speaking-singing tasks; and ten sessions of therapy within an average of 6–8 weeks was given. Each session lasted approximately 25 minutes. The first five sessions were held twice a week, then the patients were called in weekly.

5. When the patient acquired the motor skill for proper glottic closure, an oral mask was used. Oral mask was used while reading, speaking, and singing (water level was less than 5 cm H_2O).

6. The new skill was transferred to behavior by sustaining phonation without the device. Patients were motivated to use their new vocal images in their natural environment. The exercise rate was reduced, the patients intentionally used exercises when they had to remember the ideal phonatory habits.

7. In the consultation and control period, patients were given maintenance exercises and no additional therapy sessions were demanded after the conclusion of therapy. The maintenance exercises mainly focused on keeping the primal sound idea active and included warm-up tasks.

Statistical Analysis

The IBM SPSS Version 20.0 software was used for statistical analysis (IBM Corp., Armonk, NY, USA). Mean, standard deviation, frequency, and ratio values were used in the descriptive statistics of the data. The normal distribution of quantitative variables was assessed with the Kolmogorov-Smirnov test. The differences at different periods among the patients were assessed with a paired sample t-test. The independent t-test was used to assess the differences between the two groups. The numerical results were submitted as a mean ± standard deviation. In all statistical analyses, $p \leq 0.05$ was considered to represent a statistically significant difference.

Results

A total of 46 patients and 40 healthy individuals were included. Eight patients were excluded due to incomplete data. The data of 78 individuals (38 patients, 40 controls) were evaluated. Patient and control group participants were female. None of the patients had a history of LM. Basic data, i.e., age, dysphonia duration, smoking, and habitual voice use are shown in Table 1. There were no significant differences between the patient and the control groups in terms of age and smoking. Occupational voice use and vocal overuse scores were significantly higher in the nodule group.

Voice evaluation and analysis data of the patient and control groups before, in the first and sixth months after therapy are presented in Table 2. The F0, SPL, VHI-10 and MPT values of the patient and control groups before and after the treatment are shown in Figure 2.

The p-values of the statistical differences between the patients' voice-related data from three different times are shown in Table 3.

Table 1. Demographic and voice-related features

		VFN (38)	Control (40)	p
Age	(Years)	29.8±5.3	28.3±2.6	0.873
Dysphonia duration	(Months)	13.5±7.2	n/a	-
Occupational voice use (VAS)	(mm)	8.6±2.4	0.2±0.1	**<0.001**
Vocal overuse (VAS)	(mm)	8.5±3.1	1.7±0.4	**<0.001**
Smoking	Yes (%)	26.4	28.6	0.658

VFN: Vocal fold nodule, VAS: Visual analog scale, p≤0.05 refers to statistical significance

Table 2. Voice-related data of all individuals from three different periods

	Pre-treatment	Post-treatment 1st mo	Post-treatment 6th mo	Control group
	Mean ± SD	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**
VHI-10	19.52±7.44	6.22±3.14	5.18±2.69	0.73±0.61
G	2.32±1.68	0.79±0.48	0.68±0.44	0.21±0.3
R	0.93±0.67	0.55±0.64	0.52±0.6	0.11±0.28
B	1.46±0.5	0.44±0.55	0.41±0.52	0.13±0.4
F0 (Hz)	201.9±31.8	227±25.9	232±28.7	234.7±23.1
SPL	54.4±7.9	64.3±8.3	66.1±7.6	66.6±4
% Jitt	1.46±0.24	0.83±0.39	0.85±0.43	0.61±0.27
% Shimm	3.27±1.01	2.46±0.98	2.51±1.14	2.19±0.48
NHR	1.15±0.42	0.48±0.41	0.46±0.35	0.13±0.19
MPT	12.6±4.2	17.4±2.6	17.9±3.1	17.5±2.4
VLS_g	2.14±0.81	0.45±0.58	0.53±0.46	0.26±0.4
VLS_r	0.46±0.42	0.09±0.21	0.08±0.17	0.02±0.1
VLS_m	0.88±0.47	0.25±0.36	0.27±0.45	0.02±0.1
VLS_s	0.17±0.38	0.05±0.2	0.05±0.2	0.02±0.1

mo: Month, VHI-10: Voice handicap index-10, F0: Mean fundamental frequency, SPL: Sound pressure level, % Jitt: Jitter percent, % Shim: Shimmer percent, NHR: Noise-to-harmonic ratio, MPT: Maximum phonation time, VLS: Videolaryngostroboscopy (g: Glottal closure, r: Regularity, m: Mucosal wave, s: Symmetry). Values are expressed as mean ± SD, SD: Standard deviation

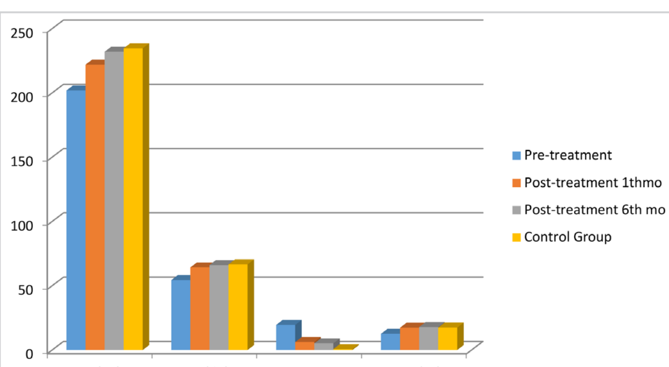

Figure 2. F0, SPL, VHI-10 and MPT values of the patients before and after the treatment and of the control group

F0: Mean fundamental frequency, SPL: Sound pressure level, VHI-10: Voice handicap index-10, MPT: Maximum phonation time

The p-values of the statistical difference between the patients' voice-related data from three different times and the data of the control group are shown in Table 4.

The VHI-10 score, which was 19.5 in the patient group before therapy, was 6.2 in the first month after therapy and 5.1 in the sixth month. The VHI-10 score was found to have statistically significantly decrease after DVT ($p<0.001$). In patients with VFN, the VHI-10 score (5.1) in the sixth month after DVT was statistically significantly higher ($p=0.001$) than that of the control group (0.73).

Related to GRB scale, patients' G, R, and B score values had decreased significantly after DVT. The G, R, and B scores of the patients before and after the treatment and the control group are shown in Figure 3. While there was no significant difference between patients' post-treatment G score values and that of the control group, R and B scores were significantly higher in the patients with VFN for all measurements (p=0.218 and 0.189 respectively).

F0, SPL and MPT values of the patients were found to be significantly increased after DVT (Table 3). The F0, SPL and MPT values of the patients in both the first and sixth months after treatment were not significantly different from those of the control group (Table 3).

Patients' % jitters and % shimmer analysis values decreased significantly after the treatment. The % jitter and % shimmer analysis values of the patients in the first and sixth months did not differ significantly from those of the control group (Tables 3 and 4). NHR analysis values of patients with VFN after treatment were significantly higher than those of the

Table 3. The p-values of the significance of the differences between the voice-related parameters of the patients in three different periods of treatment

	I pre vs. post 1st mo	II pre vs. post 6th mo	III post 1st vs. post 6th mos
VHI-10	**<0.001**	**<0.001**	0.624
G	**0.001**	**<0.001**	0.218
R	**0.001**	**0.001**	0.189
B	**<0.001**	**<0.001**	0.742
F0 (Hz)	**0.001**	**0.011**	0.456
SPL	**0.001**	**0.001**	0.345
% Jitt	**0.001**	**0.001**	0.270
% Shimm	**0.001**	**0.002**	0.763
NHR	**<0.001**	**<0.001**	0.345
MPT	**0.001**	**0.001**	0.458
VLS_g	**<0.001**	**<0.001**	0.345
VLS_r	**0.001**	**0.001**	0.463
VLS_m	**0.002**	**0.002**	0.219
VLS_s	**0.002**	**0.002**	0.720

mo/mos: Month/months, I: Pre-treatment vs. Post-treatment 1st month, II: Pre-treatment vs. Post-treatment 6th month vs. Control, III: Post-treatment 1st month vs. Post-treatment 6th month. p≤0.05 refers to statistical significance. VHI-10: Voice handicap index-10, F0: Mean fundamental frequency, SPL: Sound pressure level, % Jitt: Jitter percent, % Shim: Shimmer percent, NHR: Noise-to-harmonic ratio, MPT: Maximum phonation time, VLS: Videolaryngostroboscopy (g: Gottal closure, r: Regularity, m: Mucosal wave, s: Symmetry). Values are expressed as mean ± SD, SD: Standard deviation

Table 4. The p-values of the significance of the differences between the voice-related parameters in three different periods of the data of the patient and control groups

	I Pre- vs. Control	II Post 1st vs. Control	III Post 6th vs. Control
VHI-10	**<0.001**	**0.001**	**0.001**
G	**<0.001**	0.056	0.098
R	**<0.001**	**0.031**	**0.026**
B	**<0.001**	**0.002**	**0.002**
F0 (Hz)	**0.02**	0.166	0.887
SPL	**0.001**	0.09	0.422
% Jitt	**<0.001**	0.237	0.420
% Shimm	**<0.001**	0.224	0.094
NHR	**<0.001**	**0.021**	**0.020**
MPT	**<0.001**	0.643	0.539
VLS_g	**<0.001**	**0.03**	**0.03**
VLS_r	**<0.001**	0.136	0.082
VLS_m	**<0.001**	**0.04**	**0.04**
VLS_s	**<0.001**	0.113	0.327

mo: Month, I: Pre-treatment vs. Control, II: Post-treatment 1st month vs. Control, III: Post-treatment 6th month vs. Control. p≤0.05 refers to statistical significance. VHI-10: Voice handicap index-10, F0: Mean fundamental frequency, SPL: Sound pressure level, % Jitt: Jitter percent, % Shim: Shimmer percent, NHR: Noise-to-harmonic ratio, MPT: Maximum phonation time, VLS: Videolaryngostroboscopy (g: Glottal closure, r: Regularity, m: Mucosal wave, s: Symmetry). Values are expressed as mean ± SD, SD: Standard deviation control group (Tables 3 and 4). The % jitter, % shimmer, and NHR values of the patients before and after the treatment, and of the control group are shown in Figure 4.

The VLS scale scores were significantly lower in the first and sixth months after treatment compared to pretreatment. VLSg (glottal closure) and VLSm (mucosal wave) scores of patients in the first and sixth months after treatment were significantly higher than those of the control group. There was no significant difference between the VLSr (regularity) and VLSs (symmetry) scores of the patients in the first and sixth months after treatment and the scores of the control group. The VLSg, VLSr, VLSm and VLSs scale scores of the patients before and after treatment and of the control group are shown in Figure 5.

Discussion

VFN formation is a process that causes pathological phonation by disrupting the vibratory characteristics of VFs (14). The initial and primarily preferred method for treating this pathology is VT (15). However, scientific data regarding the effectiveness of VT are still insufficient because of the small number of cases, the lack of control groups, and insufficient data in the follow-up of those who did not receive treatment (16,17). Our study, which has similar deficiencies, is the first in the literature to present that the DVT applied alone is effective for treating VFN.

In one of the early studies, Verdolini-Marston et al. (1) evaluated thirteen women with VFN before and after therapy, using measurements of phonatory effort, perceptual vocal quality, and vocal fold appearance. Patients who received confidential or resonant VT were compared to a control group of patients who received only vocal hygiene education. The authors found that the two groups that received confidential or resonant VT showed improved voice quality and vocal fold appearance compared to the control group (18). McCrory (19) investigated the records of 26 VFN patients who received combined indirect and direct VT and reported that more than 80% showed normal voice quality or only a mild degree of dysphonia after VT. The author claimed that VT was effective in the elimination of VFNs, restoring normal voice, and improving voice quality. In their study evaluating the effectiveness of resonant VT in 26 female patients with VFN, Saltürk et al. (7) reported VT to be an effective method that provided improvement in both objective and subjective voice parameters. The authors stated that although the study group's VHI-10 scores had significantly decreased after treatment, these scores remained still high in the second month after treatment compared to the control group, indicating that patients continued to experience difficulties in vocal function.

In our study, most of the voice-related parameters in the sixth month after DVT did not significantly differ from those of the control group, but the VHI-10, roughness, breathiness, VLSg, VLSm scores, and NHR values in both the first and

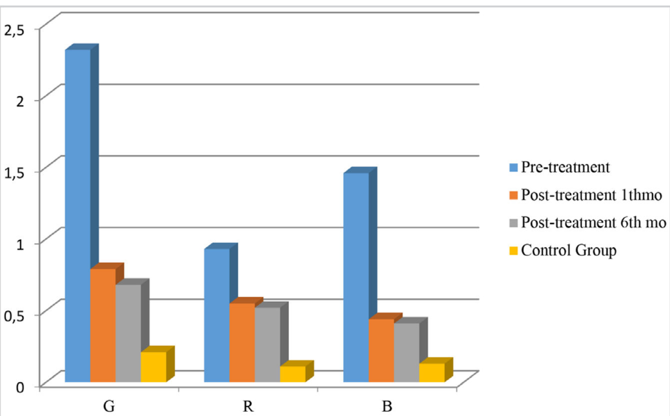

Figure 3. The auditory perceptual assessment of voice quality scores via GRB scale of the patients before and after the treatment and of the control group

G: Grade, R: Roughness, B: Breathiness

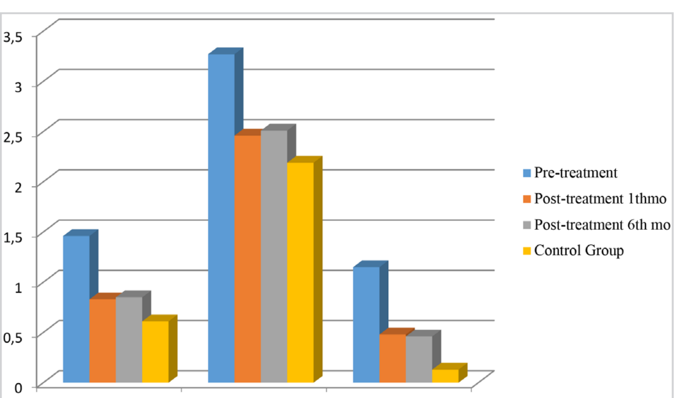

Figure 4. The % jitter, % shimmer and NHR values of the patients before and after the treatment and of the control group

% Jitt: Jitter percent, % Shim: Shimmer percent, NHR: Noise-to-harmonic ratio

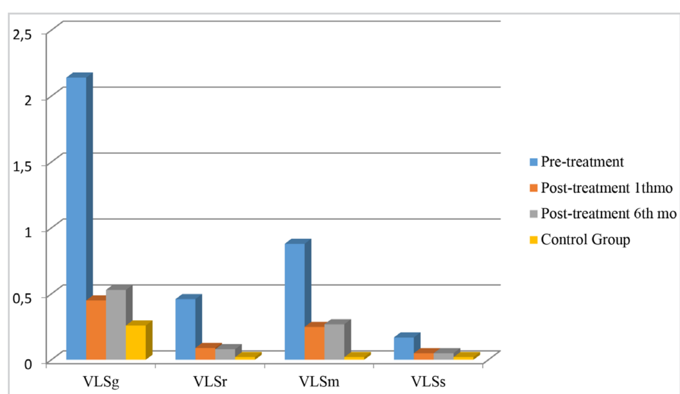

Figure 5. Videolaryngostroboscopic evaluation scores of the patients before and after the treatment and of the control group

VLSg: glottal closure, VLSr: regularity, VLSm: mucosal wave, VLSs: symmetry sixth months were significantly higher in the patient group compared to the control group. It should be noted that even if significant improvement is achieved after VT, the outcome measures may not return to normal completely, and mild dysphonia may be observed; and these possibilities should be shared with the patient prior to treatment (1,20). In our study, patients were followed up for a longer period than those in McCrory's (19) study. The significant improvement in the voice-related parameters in the first month after the DVT continued through the sixth month, as it was important to show that the efficacy of DVT continued in the next few months in a short program. In addition to the physical effects of the warming-up procedure, patients were urged to warm up their voices in the morning and take a few minutes to correct the primal voice. This behavior is also a psychological motivation for proper voice use.

LM is recommended only when VT is not helpful in VFN treatment (2,4). Murry and Woodson (21) reported that they achieved successful results with VFN via VT and combined the VT and LM methods in selected patients. In our study, LM was not required in any patient.

Béquignon et al. (22) investigated the long-term efficacy of LM alone, and a combination of LM followed by VT in VFN treatment in 60 female and two male patients. The authors reported that recurrent dysphonia was seen in 56% of the patients who did not receive VT and in 22% of those who received VT at a mean time of 5.2 years after LM. The absence of postoperative VT was found significantly associated with a higher dysphonia recurrence. The referred study is important in terms of providing long-term data for the treatment of VFN. There are no data on such long-term outcomes regarding the efficacy of VT in the treatment of VFN. Although the DVT program results after six months were found to be quite satisfactory in our study, further studies on long-term results are required.

Phonation into tubes with one end submerged in water is shown to increase the inertance of the vocal tract. In an inertive vocal tract, phonation threshold pressure decreases, fast-easy opening and closure of the VF is promoted, and maximum flow declination rate increases (23,24). Furthermore, cellular mechanotransduction effects of vibratory backpressure possibly make anatomical changes more prominent. The biofeedback issues in the DVT program increase patient adherence and result in a high rate of the execution of at-home exercise programs.

Holmberg et al. (6) reported that VT had a positive effect on voice quality, vocal status and vocal function for most patients with VFN. We also found similar results in our study as the DVT program is a holistic method including behavioral elements. Especially at the first level of the DVT program and before vocal exercises are started, counseling, relaxation, posture, and breathing issues are reviewed. VT for VFNs must restore the balance between pulmonary support and vibratory forces (25). Holmberg et al. (6) reported that 11 women with VFN showed improvement in various perceptual voice assessment parameters after receiving a behaviorally based VT protocol.

Fu et al. (9) compared the multidimensional outcome results between two VT techniques according to the intensity of treatment in 53 women with VFN. In their study, all patients received one session of vocal hygiene and eight sessions of direct VT. They reported that both treatment methods improved the perceptual vocal quality and acoustic parameters to the same extent. In our study, significant physiological and acoustical results of the DVT supported the efficient clinical use of the VT.

Hyperfunctional vocal behavior in VFN patients can also constrict the supraglottal vocal tract and can suppress optimal VF vibration (26). One of the main goals of VT is to increase the efficient transmission of sound energy by optimizing the resonance characteristics of the supraglottic tract (7,14,27). The benefit of artificial elongation of the vocal tract using resonance tubes, as in DVT practice, is mainly to lower the first formant. This elongation allows the patient to experience the sensory effects of lower phonation threshold pressure, and a lowered average airflow which creates a low-effort voice production (4,28,29).

One of drawbacks of this study was that the number of patients was not high; however it was sufficient for an adequate statistical analysis. Another drawback of our study is that DVT was not compared with different therapy methods. There is a need for large-scale studies that compare larger VFN patient groups managed with different methods such as different VT techniques, vocal hygiene alone, local steroid injection, LM, or follow-up alone (counseling without vocal exercises), and a combination of different methods with follow-up. The strengths of the current study include the relatively long follow-up period when compared to literature and use of multidimensional voice outcome measurements. Besides, the current study is the first one in the literature to present the effectiveness of DVT in VFN treatment for the first time.

Further studies are needed in which different versions of the DVT program are applied, DVT is compared with other VT techniques, and the factors affecting our therapy technique are investigated with a larger group of patients.

Conclusion

VT is essential for treating patients with VFN. This study revealed that DVT significantly improved objective and subjective voice-related parameters in patients with VFNs. We suggest that DVT can be used as an effective method for treating VFNs.

Ethics Committee Approval: This study was conducted in a voice clinic of a university hospital and approved by the Institutional Review Board of the Local Ethics Committee of Aydın Adnan Menderes University (decision number: 2017/238).

Informed Consent: Informed consent was obtained.

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Authorship Contributions

Surgical and Medical Practices: İ.D., E.Ş.O., Concept: İ.D., M.Ş., Design: İ.D., M.Ş., E.Ş.O., Data Collection or Processing: İ.D., M.Ş., Analysis or Interpretation: İ.D., M.Ş., Literature Search: İ.D., M.Ş., E.Ş.O.,N Writing: İ.D., M.Ş., E.Ş.O.

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Main Points

- Vocal fold nodules (VFNs) are the common causes of hoarseness in the population.
- There is not enough evidence as to which method is effective in the treatment of patients with VFN.
- There is no research presenting the results of the use of DoctorVox voice therapy (DVT) in the treatment of VFNs.
- In this study, we aimed to evaluate the efficiency of DVT for the treatment of VFNs.
- This study revealed that DVT significantly improved objective and subjective voice-related parameters in patients with VFN. DVT technique can be applied as an effective treatment for VFN.

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