An Analysis of the Effects of Voice Therapy on Patients With Early Vocal Fold Polyps

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Summary: Objective. This study aimed to analyze the voice characteristics of patients with early vocal fold polyps and to investigate the effects of voice therapy on patients.

Methods. Voice therapy was conducted on 88 patients with early vocal fold polyps in an experimental group. Laryngostroboscopy, the voice handicap index (VHI), and the dysphonia severity index (DSI) were applied to evaluate the patients' voice quality before and after treatment. Thirty-one healthy volunteers also underwent evaluation of voice quality as a control group. The intergroup and intragroup differences in the results of laryngostroboscopy, VHI, and DSI were compared statistically.

Results. In the experimental group, 22 patients withdrew from the treatment for various reasons. After voice therapy, the cure rate was 30.3% (20/66). All the VHI values in the experimental group before treatment were statistically worse than the values in the control group. The *P* and *T* values of the VHI in the experimental group were still worse after treatment than the values in the control group, although the VHI did improve after treatment in the experimental group. The maximum phonation time (MPT), jitter, *I*-low, and DSI were statistically different between the control group and the experimental group both before and after treatment. Furthermore, the MPT, jitter, F_0-high, *I*-low, and DSI improved after treatment in the experimental group.

Conclusions. Patients with early vocal fold polyps have some degree of subjective and objective dysphonia. Voice therapy can improve the voice quality in these patients.

Key Words: Vocal fold polyp–Voice therapy–Dynamic laryngoscope–Voice handicap index–Dysphonia severity index.

INTRODUCTION

Vocal fold polyps are a common benign proliferative lesion of the vocal fold that present clinically in the superficial lamina propria of the vocal fold. Currently, the exact pathogenesis of vocal fold polyps has not been fully illustrated. Petrovic-Lazic et al (2015)[1] reported that all analyzed acoustic parameters in patients with vocal fold polyps improved after the phonomicrosurgery and voice therapy, and they tended to approach the values of the control group. However, an investigation by physicians from the Department of Otolaryngology in America revealed that 91% of physicians choose voice therapy as the preferred treatment for vocal fold nodules, but only 30% of physicians choose voice therapy as the preferred treatment for vocal fold polyps.[2] The main reason may be that few studies have been reported on the effects of voice treatment in patients with vocal fold polyps. Particularly, there is a lack of large-scale case studies reflecting the subjective and objective sound quality changes in patients with vocal fold polyps before and after voice treatment. In a multivariate analysis of 158 patients diagnosed with vocal polyps who received voice therapy, Cho et al (2011)[3] suggested that among clinical factors such as the size, location, site of origin, and color of vocal fold polyps, as well as the presence of hypopharynx reflux, polyp size was the only factor associated with the sound quality. In their study, smaller polyps were associated with a better effect of voice treatment. Dursun et al (2010)[4] found that, compared to patients with large polyps, those with small polyps had significantly less fundamental frequency perturbation (jitter). The previously mentioned reports suggest that patients with small early vocal fold polyps may exhibit specificity with regard to the pathogenesis, dysphonia characteristics, treatment, and prognosis of the polyps.

The voice, a complex multidimensional phenomenon, is both an acoustic phenomenon of vocal fold vibration and sound generation as a result of expiratory flow and a subjective psychological auditory phenomenon. Commonly used means of clinical assessment of dysphonia include laryngostroboscopy, the voice handicap index (VHI), dysphonia severity index (DSI), and so forth.[5–13]

The main purpose of this study was to evaluate changes in the degree of dysphonia in patients with early vocal fold polyps by laryngostroboscopy, the VHI, and the DSI before and after voice treatment. This study aimed to address the following questions: (1) the characteristics of subjective and objective assessments of voice in patients with early vocal fold polyps; (2) the effects of voice treatment on patients with early vocal fold polyps.

MATERIALS AND METHODS

Clinical data

The experimental group was composed of 88 patients with vocal fold polyps treated in the Department of Otolaryngology, Jinhua Central Hospital, from June 2011 to December 2012, with an average disease course of 4.05 ± 1.11 months. In 41 patients, the polyps were bilateral, and in the others, they were unilateral. The inclusion criteria were as follows: chief

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complaint of hoarseness; disease course of less than 6 months; and a vocal fold polyp located at the junction of 1/3 of the front and the middle of the vocal fold under a laryngoscope, presenting as a small fusiform translucent bulge with a diameter less than 1/4 of the length of the vocal fold.[3] The exclusion criteria were as follows: vocal fold polyps with a diameter greater than 1/4 of the vocal fold length or pedunculated polyps; vocal fold tumors; vocal nodules; or Reinke edema. During the experiment, 22 patients in the experimental group withdrew from treatment for several reasons. The withdrawal rate was 25% (22/88). The remaining 66 patients completed the treatment program, including 18 men and 48 women. The mean age was 37.52 ± 9.17 years. In the control group, there were 31 healthy volunteers, including 9 men and 22 women, and the mean age was 32.48 ± 5.8 years. To ensure that the vocal folds of the control subjects were healthy, these subjects had no hoarseness or other clinical complaints, no chronic pharyngitis, no chronic laryngitis, and no history of laryngopharyngeal or esophageal reflux disease. The balancing test showed no significant difference in the age ($t = -0.904$; $P = 0.369$) and gender ($z = 0.934$, $P = 0.348$) between the 66 patients that completed the treatment in the experimental group and those in the control group. Subjects in both the experimental and the control groups signed informed consent forms. This study was conducted in accordance with the declaration of Helsinki. This study was conducted with approval from the Ethics Committee of Jinhua Central Hospital. Written informed consent was obtained from all participants.

Laryngostroboscopy

The polyps were detected using a laryngostroboscopy system from XION, Berlin, Germany. For the examination, the subjects sat in a quiet environment, and the pharyngeal mucosa was anesthetized three times using 1% tetracaine spray. The subjects were asked to relax and breathe calmly. A rigid laryngoscope warmed to 70° was placed into the mouth of each subject. The lens was closed to the posterior pharyngeal wall and parallel to the level of the vocal fold. The subjects were instructed to produce /I/, and a designated examiner observed the vocal fold polyp volume and location, as well as the vocal fold vibration symmetry, period, amplitude, and closure, and the mucosal waves on a television screen. These features were recorded on video, and the characteristics of the disease condition were assessed.

Self-assessment of subjective dysphonia

A resident was designated to be responsible for interpreting the significance of the investigation. Using the Chinese version of the VHI,[14] the subjects appraised themselves in three areas, including physiology (P), function (F), and emotion (E). Each part included 10 questions, and the responses represented the frequency of occurrence: 0 represented "never"; 1 represented "very little"; 2 represented "sometimes"; 3 represented "often"; 4 represented "always." The total score of each part was the sum of the scores for the 10 questions. The scores ranged from 0 to 40 points; the total score (T) was the sum of the scores of the three parts, ranging from 0 to 120 points. The higher the score for each part of the evaluation, the greater the impact of dysphonia according to the patient. The higher the total score, the more severe the subjective assessment of dysphonia.

Objective acoustic and aerodynamic evaluation and DSI calculation

The evaluation was conducted in a soundproof room (in line with the acoustical criteria of a living room),[15] using *DiVAS* voice analysis software from XION, Germany. The subjects wore a headset with a microphone, with 30 cm between the microphone probe and the mouth. The subjects were asked to relax and breathe calmly. Testing of maximum phonation time (MPT), jitter, F_0-high, and *I*-low was conducted according to requirements, and the DSI scores were calculated.

MPT test

After performing deep breathing, the subjects persistently pronounced the vowel "a" with a conscious and comfortable pitch and sound intensity for as long as possible. The test was conducted three times, and the result of the longest sound sample was used for the analysis.

Jitter test

Examinees persistently pronounced the vowel "a" with a conscious and comfortable pitch and sound intensity. The duration was approximately 3 seconds, and the test was conducted thrice. The jitter value of each sample was evaluated from 0.5 to 1.5 seconds after the start. The average value from the three trials was used in the analysis.

F_0-high and *I*-low test

The examinees persistently pronounced the vowel "a" with a conscious and comfortable pitch and sound intensity. This particular comfortable pitch and sound intensity was recorded. On the basis of this, examinees gradually pronounced the sound with a pitch and sound intensity as high as possible and with a pitch and sound intensity as low as possible. The average values of F_0-high and *I*-low from the three trials were used in the analysis.

DSI score calculation

The DSI scores were automatically calculated using *DiVAS* voice analysis software on the basis of the MPT, jitter, F_0-high, and *I*-low values.

Voice therapy programs

The patients in the experimental group received approximately 3 months of voice treatment in the form of a training program. The subjects had one therapy session every 2–3 weeks. Each session lasted approximately 60–90 minutes. Four physicians with knowledge and skills required for voice therapy from the Department of Otolaryngology presented brief explanations of vocal polyps and voice therapy. The main components of the training program were as follows: (1) relaxation training; (2) breathing exercises; (3) vocal function exercises; (4) resonant improvement exercises; (5) carryover exercises; (6) prevention of misuse and