Efficacy of Voice Therapy for Patients With Early Unilateral Adductor Vocal Fold Paralysis

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Summary: Objectives. Although a variety of therapeutic techniques have been suggested for patients with unilateral adductor vocal fold paralysis (UAVFP), they were not aimed specifically at determining the efficacy of early intervention for these patients. The purposes of this study are to explore a protocol of voice therapy and to investigate its efficacy in voice therapy for patients with early UAVFP. A 12-week planned voice therapy protocol, including vocal function exercise, hard attack, and resonance voice therapy, was given to 10 patients within 6 months of initial diagnosis. Additionally, nine patients diagnosed with UAVFP within 6 months served as controls.

Methods. Multidimensional evaluations of voice function were obtained for statistical analyses.

Results. Compared to a control group, the experimental group receiving voice therapy exhibited significant improvement in the following: (1) glottal closure; (2) voice quality of grade, breathiness, monotone, and resonance; (3) acoustic measurements of jitter, shimmer, and noise-to-harmonic ratio; (4) aerodynamics measurements of maximum phonation time, phonation threshold pressure, and phonation quotient; and (5) Voice Handicap Index of functional subscale.

Conclusion. This prospective study established an effective protocol of early intervention of voice therapy in patients with UAVFP and demonstrated its efficacy in data on laryngeal physiology, voice quality, voice stability, voice efficiency, and communication function.

Key Words: Unilateral vocal fold paralysis–Voice therapy–Auditory perception judgment–Laryngeal pathology–Acoustic.

INTRODUCTION

Vocal fold paralysis is the most common neurogenic voice disorder, approximately 8% of the incidence of all laryngeal pathologies,[1,2] and unilateral adductor vocal fold paralysis (UAVFP) is the most common type of vocal fold paralysis.[3–7] Primary etiologies of UAVFP include lesions on the pathway of the vagus nerve, neuritis, intubation, systemic disease, or idiopathic diseases.[8,9]

Patients with UAVFP usually would not have surgical intervention immediately after onset because of the possibility of spontaneous recovery during the initial stage. In general, surgical intervention is suggested for patients with UAVFP 6 to 12 months after onset.[4,8,10–15] Surgical intervention for patients with UAVFP is primarily some form of surgical medialization, usually intracordal injection or thyroplasty, to improve poor voice quality or an aspiration problem.[10]

The management of UAVFP during the initial stage, defined here as 6 months following the initial voice symptoms, includes voice therapy or follow-up. Several investigations have reported that voice therapy during this initial stage was efficacious and suitable for patients who have mild symptoms or dysphagia without aspiration.[15–17] Mathieson and Greene[8] reported that patients with UAVFP underwent voice therapy for at least 6 months after onset, and then searched for other treatments if unsatisfied. Although early intervention of voice therapy for patients with UAVFP was recommended by Mathieson and Greene, a voice therapy protocol for early intervention, and its efficacy, has not been reported.

A variety of voice therapy techniques has been used for patients with UAVFP16, 18–26, but they are not focused on the efficacy of the management of early-onset UAVFP; furthermore, these techniques did not show consistent results. Several techniques have been reported to improve phonatory function in patients with UAVFP, including head turning, digital pressure, half-swallow boom,[18] pushing exercises,[19] accent method,[20] twang therapy,[21] combining forward resonant placement with deconstriction,[16] combining pushing exercises with head turning,[22] and combining head turning, digital pressure with nasal glides.[23] Other techniques appear to be less effective; for example, head turning did not improve airflow rate,[24] and the general elements of logopedic voice therapy such as voice hygiene advice, exercise training, and integration of the newly obtained vocal behavior in spontaneous voicing and speaking did not improve glottal insufficiency.[25,26]

To our knowledge, only one case study[14] and two retrospective studies[27,28] have reported phonatory improvements with early voice therapy for UAVFP. Although these studies showed a positive outcome, the potential effects of spontaneous recovery were not controlled. It is possible that nerve regeneration can occur in patients with UAVFP during the initial stage, and the putative effects of treatment may have been due to spontaneous recovery, voice therapy, or a combination of both.[29] This concern can be addressed with a proper control group of persons with UAVFP in the initial stage, who does not receive the treatment provided to the experimental group.

The present study investigated the efficacy of three techniques commonly used to treat UAVFP: hard glottal attack, vocal function exercises (VFE), and resonance voice therapy (RVT). A

Accepted for publication January 11, 2017.

This work was supported by Research Grant Number NSC 100-2410-H-010-005-MY2 from the National Science Council, Taiwan.

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Journal of Voice, Vol. 31, No. 5, pp. 567–575

0892-1997

http://dx.doi.org/10.1016/j.jvoice.2017.01.007

combination of these techniques was used to establish a practical protocol and to examine the efficacy of this protocol for early intervention. Hard glottal attack and pushing exercises aim to improve glottal closure, cause contraction of the thyroarytenoid muscle on the healthy side of the vocal fold, and produce voice in the modal register, but both techniques frequently result in compensatory, hyperfunctional behaviors.[7,30] VFE is a holistic and whole-body exercise maneuver to improve the capability of the vocal folds to move to the midline. The low-impact adductory power exercise in VFE may alleviate the hyperfunction and promote glottal closure.[23] VFE exercises were designed to strengthen and balance the laryngeal musculature and balance airflow to the muscular effort.[31] Four steps in VFE exercises, including warm-up, stretching exercises, contracting exercises, and low-impact adductory power exercises, were included in the protocol of the current study. RVT has recently been applied to patients with UAVFP to enhance voice quality, phonation function, and communication function.[28] RVT emphasizes appropriate forward resonance and easy phonation, which may result in improved glottal competence. Even if patients have reduced maximum phonation time (MPT), the RVT technique would help them produce voice more easily.[31]

Previous investigations of therapeutic effects on voice production in the initial stage of UAVFP have had limitations, such as a small number of participants, lack of a proper control group, single-dimension evaluation of voice function, and a lack of carryover, or a failure to evaluate carryover. Furthermore, it is not known if the techniques used by previous investigations are suitable for early intervention of voice therapy for patients with UAVFP. Therefore, it is desirable to establish an effective protocol for early intervention of voice therapy for patients with UAVFP and to examine its efficacy using multidimensional evaluation, including laryngeal physiology, voice quality, acoustics, aerodynamics, and communication function.

MATERIALS AND METHODS

Participants

A total of 19 participants with UAVFP within 6 months of onset, diagnosed by certified otolaryngologists based on a videostroboscopic examination and patient-reported history, comprised the experimental and control groups. Patients who required further medical treatment or surgical procedures were excluded. The inclusion criteria were the following: (1) no voice therapy or surgical treatment for their vocal paralysis; (2) no evidence of other central neurological diseases, such as Parkinson's disease, cerebellar disorders, or stroke; (3) no signs of other voice disorders, such as vocal nodules or vocal polyp; (4) a native speaker of Mandarin; (5) able to read a selected passage; (6) no aspiration; and (7) having normal hearing with pure-tone average (500, 1000, 2000, and 4000 Hz) less than 25 dB HL in their better ear (less than 35 dB HL for participant aged over 60 years). These criteria were assessed by the first author, an experienced speech pathologist specializing in voice therapy. All participants agreed to participate in this study and signed an informed consent. After the explanation of the purposes and the procedures of this study, participants were assigned to the experimental or the control group based on a random number table.

Participants of the experimental and control groups were evaluated pre- and postvoice treatment at comparable intervals. Participants of the experimental group received a planned voice therapy protocol (see below), but participants of the control group were only educated regarding vocal hygiene. The experimental group consisted of six females and four males, aged between 32 and 68 years (mean = 57.7 years; SD = 11.9 years). The average time after onset of UAVFP was 2.9 months, ranging from 3 weeks to 5 months. The average period between pre- and posttherapy was 12.4 weeks, and ranged from 8 to 16 weeks. The control group consisted of six females and three males, aged between 39 and 68 years (mean = 55.8 years; SD = 8.8 years). The average time after onset of UAVFP was 2.8 months, ranging from 1 week to 6 months. The average period between pre- and posttherapy was 12.8 weeks, ranging from 11 to 16 weeks. Etiologies of UAVFP and the paralytic side of vocal folds for the experimental group were one viral infection on the left side, two idiopathic on the left side, two iatrogenic on the right side, and five iatrogenic on the left side. Etiologies of UAVFP and the paralytic side of vocal folds for the control group were two viral infection on the left side, two idiopathic on the left side, three iatrogenic on the right side, and two iatrogenic on the left side. The position of the paralyzed vocal fold was not accounted for in the current study.

The protocol of voice therapy

A total of 16 voice therapy sessions (one session each week) were provided in the planned voice therapy protocol. Each participant in the experimental group received at least seven sessions before posttherapy evaluation. The average period between pre- and posttherapy was 12.4 weeks, ranging from 8 to 16 weeks. Therefore, not all participants advanced to the second and third stages of therapy. The planned voice therapy protocol included hard glottal attack, VFE, and RVT. Hard glottal attack was aimed to improve glottal closure. The participants in the experimental group were restricted to less than two times of homework practice per day to avoid undesirable compensatory behaviors, and a videostroboscopic examination was frequently used to monitor their supraglottic hyperfunction. The VFE and RVT were used to develop optimal breathing support, relaxation, and appropriate tone focus. Moreover, RVT may enable participants to apply learned techniques, such as frontal focus, to daily communication.

The voice therapy protocol includes three stages. Each stage had specific goals and four sessions, and required homework for every session was completed after treatment. The first stage (1st to 4th weeks) included breathing control, vocal hygiene, relaxation exercise, and VFE demonstration, and the goals were the following: (1) participants could phonate using abdominal breathing support; (2) participants could feel the tension of muscles in the throat, neck, and shoulders, and then relax; and (3) under instruction and demonstration, participants could implement VFE programs correctly and over 5-second MPT. The second stage (5th to 8th weeks) included relaxation exercise, VFE programs, and hard glottal attack. The goals were the following: (1) participants could release the tension in throat, neck, and shoulders by self-monitoring; (2) under cuing, participants could