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Short and intensive therapy with finger kazoo in patient with organic dysphonia post-orotracheal intubation

Terapia breve e intensiva com finger kazoo em caso de disfonia orgânica pós-intubação orotraqueal

Terapia breve e intensa con finger kazoo en paciente con disfonía orgánica postintubación orotraqueal

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Abstract

Objective: *to evaluate the effect of a program of brief and intensive therapy with finger kazoo technique in adult female patient with organic dysphonia.* ***Presentation of the case:*** *were realized aerodynamic, acoustic, perceptual, videolaryngostroboscopic measures and vocal self-assessment before and after 15 sessions of short and intensive therapy with finger kazzo technique in a 62 years woman with organic dysphonia by fibrosis in the right vocal fold, glottis of irregular type with phase asymmetry and amplitude, and edema of the glottis and contraction of the anterior portion of the right vestibular fold*

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due to endotracheal intubation. ***Results:*** *After therapy, there was improvement of maximum phonation time, acoustic frequency measurements, frequency of disturbance noise, sub-harmonic segments, improved stroke spectrographic and all perceptual parameters, as well as improvement of quality of life scores, depression and anxiety. In the videolaryngostroboscopy evaluation, there was improvement in range of mucosa vibration of the vocal folds and reduction of medial constriction of the laryngeal vestibule.* ***Conclusion:*** *there were positive vocal changes in glottic, respiratory and resonant level, videolaryngostroboscopy and vocal self-assessment, emphasizing that this was an effective treatment modality for the case.*

Keywords: *Voice; Speech therapy; Dysphonia*

Resumo

Objetivo: *avaliar o efeito de um programa de Terapia Breve e Intensiva com a técnica finger kazoo em paciente adulta do sexo feminino com disfonia orgânica.* ***Apresentação do caso clínico:*** *realizadas medidas aerodinâmicas, acústicas, perceptivo auditivas, videolaringoestroboscópicas e autoavaliação vocal antes e após 15 sessões de terapia breve e intensiva com a técnica finger kazzo em uma mulher de 62 anos com disfonia orgânica por fibrose em prega vocal direita, fenda glótica do tipo irregular, com assimetria de fase e amplitude, além de edema da subglote e retração da porção anterior da prega vestibular direita decorrente de intubação orotraqueal.* ***Resultados****: Após a terapia, houve adequação dos tempos máximos de fonação, de medidas acústicas de frequência, perturbação de frequência, ruído, segmentos sub-harmônicos, melhor delineamento do traçado espectrográfico e de todos os parâmetros perceptivo auditivos, além de aumento dos escores de qualidade de vida, de depressão e ansiedade. Na avaliação videolaringoestroboscópica, houve melhora da amplitude de vibração da mucosa das pregas vocais e redução da constrição medial do vestíbulo laríngeo.* ***Conclusão:*** *houve modificações vocais positivas em nível glótico, respiratório e ressonantal, bem como no exame videolaringoestroboscópico e na autoavaliação vocal, evidenciando que essa foi uma modalidade de tratamento efetiva para o caso.*

Palavras-chave: *Voz; Fonoterapia; Disfonia*

Resumen

Objetivo: *evaluar los efectos de un programa de Terapia Breve e Intensa utilizando la técnica finger kazoo en una paciente adulta del sexo femenino con disfonía orgánica.* ***Presentación del caso clínico:*** *fueron realizadas las medidas aerodinámicas, acústicas, perceptivo auditivas, videolaringoestroboscópicas y autoevaluación vocal antes y post 15 sesiones de terapia breve e intensa con la técnica finger kazzo en una mujer de 62 años con disfonía orgánica por fibrosis en la cuerda vocal derecha, hiato glótico irregular, con asimetría de fase y amplitud, además de edema de la subglotis y retracción de la porción anterior de la cuerda vestibular derecha debido a intubación orotraqueal.* ***Resultados:*** *Después de la terapia, hubo adecuación en los tiempos máximos de fonación, de las medidas acústicas de frecuencia, perturbación de frecuencia, ruido, segmentos sub-armónicos, mejora del trazado espectrográfico y de todos los parámetros perceptivo auditivos, así como mejora de los puntajes de calidad de vida, depresión y ansiedad. En la evaluación videolaringoestroboscópica, hubo mejora en la amplitud de vibración da la mucosa de las cuerdas vocales y reducción da la constricción mediana del vestíbulo laríngeo.* ***Conclusión:*** *hubo positivos cambios vocales a nivel glótico, respiratorio y resonante, así como en el examen videolaringoestroboscópico y en la autoevaluación vocal, lo que enseña que la modalidad de tratamiento fue efectiva para el caso.*

Palabras clave: *Voz; Logoterapia; Disfonía*

Introduction

Endotracheal intubation allows ventilatory assistance in anesthetized or mechanically ventilated patients. However, in some cases it causes compromising of the posterior region of the larynx, in the vocal processes of the arytenoid cartilages, where the oro or nasotracheal tube is positioned and may result in ulceration which involves the epithelium of the interaritenoid mucosa, healing with fibrosis and fixation of the arytenoid cartilages in the median line, which may affect the voice.

There are three risk factors for endotracheal post-intubation complications: patient-related factors, such as advanced age, as the laryngeal mucosa becomes more fragile, history of intubation and smoking; Factors associated with the technical conditions to achieve and maintain intubation, such as prolonged duration, endotracheal tube size, patient agitation, probe malposition (placed far above or below the glottis, with a balloon located in the cricoid ring), poor humidification of inspired air and local infection as well as factors related to the physician such as lack of experience and the difficulty of placing the endotracheal tube in the appropriate place.

A large part of the post-intubation laryngeal lesions is solved spontaneously by the epithelial regeneration capacity. However, in certain circumstances, which lead to decreased tissue perfusion and poor healing, the process may lead to laryngeal lesions of varying severity.

The healing of lacerations of larynx mucosa can occur at the cost of adhesions and fibroses. When they settle in the anterior commissure of the glottis, they promote great damage to the voice because it compromises the phonatory portion. In these cases, it is necessary to perform speech therapy in order to achieve the best possible voice.

The literature currently highlights the use of brief and intensive therapy (TBI), a treatment modality that can be used in cases of dysphonia and aims at the efficient and effective restoration of the best possible voice in a short period of time. Vocal techniques, such as Finger Kazoo (FK), provide improvements in voice, as has been shown by some studies. Thus, TBI with daily practice of the technique (s) chosen for the speech therapy favors the potentialization of the beneficial effects of the technique, maintaining this new adjustment in long term.

Regarding FK, the technique chosen for the present case study, during its execution, there is an increase in supraglottic air pressure, which generates retroflex resonance and elevates pressure at the glottis level, leading to vocal fold spacing and reducing impact when they come in contact medially. Scientific studies also show that this technique provides adequate vocal self-perception, of vocal resonance and voice type, with greater emission stability. Acoustic analysis evidences noise reduction and greater harmonic energy due to the probable increase in vibration quality of the mucosa wave of the vocal folds.

Thus, the objective of this study was to evaluate the effect of a TBI program with the FK technique in an adult female patient with organic dysphonia due to fibrosis in the right vocal fold, a glottic cleft of the irregular type, with phase asymmetry and amplitude, besides and of the subglot and retraction of the anterior portion of the right buccal fold due to orotracheal intubation.

Method

This work is characterized by being a case study, which was previously approved by the Research Ethics Committee of the Federal University of Santa Maria (nº 016945 / 2010-76) and the patient in question was invited to read and sign the Free and Informed Consent (TCLE), as recommended by resolution 466 of the National Commission for Research Ethics - CONEP / 2012.

Patient C., female, retired dental surgeon, 62 years old, 56 kg, 1.67 m, attended a speech therapy service with complaints of hoarseness, fatigue and voice failures. She denied smoking and drinking alcohol. Regarding general health, she had undergone previous endocrinological treatment and surgical intervention with orotracheal intubation, due to a nodule in the thyreoid gland and otorhinolaryngological treatment for sinusitis. At the time, she underwent psychiatric treatment because of bipolar disorder. In addition, there were no particularities regarding the evaluation of the stomatognathic system and hearing screening (Fonix FA 12 Digital audiometer, Frye Electronics, USA).

Evaluations

All the evaluations mentioned below were performed before and after the TBI with FK for the comparison of the results.

Vocal self-evaluation: The patient completed the Vocal Participation and Activity Profile (PPAV) protocols; (VLP), Vocal Symptom Scale (ESV) and the Hospital Anxiety and Depression Scale (EHAD), and also filled out another protocol (Appendix 1) with several sensory options positive and negative, distributed randomly, in which she could mark how many of them she was feeling. The following values were used as cutoff points: in PPAV, for the total score in cases of non-teachers such as the patient in question, cutoff point in QOL, emotional aspect 3, functional 7.5, organic 10.5 and total 19, In ESV, physical aspect 6, 5, limitation 11.5, emotional 1,5 and total 16, in EHAD, 11 points were considered cutoff value for both anxiety and depression.

Aerodynamic measures: The maximum phonation times of the phonemes / a /, / i /, / u /, and /e / s / and / z / were collected after a deep inspiration in habitual pitch, loudness and vocal quality, In the orthostatic position and in a single exhalation, in addition to the voiceless \e\ (/ ė /), under the same conditions. Each issue was performed twice and it was considered the highest timed value in seconds.

All emissions were recorded with an ECM 8000 omnidirectional professional microphone (Behringer, Germany) (flat frequency response 15 Hz to 20 kHz), coupled to the H4n (Zoom, USA) professional digital recorder (96 kHz, 16 bits, and configured in 50% of the input signal), which was positioned at a distance of four centimeters in front of the mouth for the sustained vowels and ten centimeters for the fricatives, with a 90° angle to the mouth.

The forced vital capacity (FVC) was collected with Spirobank II portable digital spirometer (Medical International Research, Italy). The patient remained seated, the mouthpiece, inserted into the turbine at 0.5cm, was placed in the patient's mouth and the nasal clip was placed in the nose. Afterwards, C performed a maximal inspiration followed by a maximum expiration in the apparatus. It was considered the highest value obtained among three collections performed with nasal occlusion.

From the highest FVC value, the relationship between the obtained TMF (TMF) (higher value of the TMF/a/) and the predicted TMF (TMF) was calculated, which resulted from the multiplication of the FVC value by 0.0051. Afterwards, TMFO was divided by TMFP, considering values between 0.9 and 1.1 as regular ones. Lower values were considered as suggestive of aerial leakage to phonation and higher values suggestive of glottic hyperfunction. The calculation of the Simple Fonic Coefficient (CFS) was performed by dividing the value of the highest FVC by the highest FWM/a/.

During the emission of the vowel / a /, the sound pressure level (NPS) (Icel apparatus, DL-4200, Brazil) was measured at 30 cm in front of the mouth and adjusted in the weighting circuit – 'A' and response circuit - SLOW.

Acoustic vocal measures: The TMF/a/was edited, removing the vocal attack and the end of the emission, resulting in a window of time of 6 seconds, with sample rate of 44 kHz and 16 bits, analyzed through Multi-Dimensional Voice Program Advanced (MDVPA) (Kay Pentax®, United States). The frequency measurements were: fundamental frequency (f0), maximum f0 (fhi), minimum f0 (flo), standard deviation of f0 (STD); frequency disturbance measures: Absolute Jitter, Percent or Relative Jitter (Jitt), relative Mean of Pitch Disturbance (RAP), Pitch or Frequency Disturbance Quota (PPQ), pitch or Smoothed frequency (sPPQ), Variation of f0 (vf0); Amplitude perturbation measures: absolute or dB shimmer (ShdB), percentage or relative Shim (Shim), Amplitude disturbance quotient (APQ), smoothed amplitude perturbation quotient (sAPQ), Amplitude variation (vAm); noise measurements: Noise-harmonic ratio (NHR), Vocal turbulence index (VTI), Soft phonation index (SPI); The measures of break of voice: Degree of vocal breaks (DVB), number of vocal breaks (NVB); Measures of deaf or non-voiced segments: Number of non-voiced segments (NUV), degree of non-voiced segment (DUV); The measures of sub-harmonic segments: Degree of subharmonic components (DSH), number of subharmonic segments (NSH). For the measurement of f0, it was used the reference female values, from 150 to 250 Hz.

Also, the TMF/a/edited in the program Real Time Spectrogram (RTS) (Kay Pentax®, USA) was analyzed, by means of which the broadband spectrographic tracings (EBL), filtered in 100 points (646, 00 Hz) and EBE with a filter of 1024 points (63.09 Hz), with sampling rate of 11 kHz, 16 bits and resolution of 5 kHz.

The parameters considered in the EBL were: darkening of the tracing of the first formant (F1), F2, F3 and F4, darkening of the tracing of low, medium and high frequencies; definition of F1, F2, F3 and F4; regularity of the layout and presence

of low, medium and high frequency noise. The parameters considered in EBE were: darkening of the trajectory of low, medium and high frequencies; replacement of harmonics by noise in low, medium and high frequencies; presence of noise among harmonics in low, medium and high frequencies; definition of harmonics of the low, medium and high frequencies; regularity of the tracing of low, medium and high frequencies; number of harmonics of low, medium and high frequencies and presence of sub-harmonics.

The spectrographs were analyzed visually and individually by three speech-language pathologists with experience in the area of voice and acoustic analysis, based on specific protocol. Each aspect described above was evaluated using an analogue visual scale that was 10 cm in length (zero to 100 mm) and the judges performed the marking of the deviation degree considering the left extremity (zero) as the total absence of the parameter evaluated and the right one as the maximum degree of the parameter in question, so the number of millimeters marked on the scale could be converted into percentage. The judges received, along with the spectrographic images for the analysis, an anchor spectrograph, considered normal, to reduce the subjectivity of the evaluation. For purposes of results, the average of the three judges' evaluation was considered.

Videolaringostroboscopy evaluation: performed by an otorhinolaryngologist (ORL), using Atmos apparatus (Lenzkirch, Germany) with a 70º Storz optic (Tuttlingen, Germany). During the examination, C. remained seated, with head slightly tilted forward and upward, and sustained vowels /e\ and /i/, in addition to two transmissions of reverse phonation. The otorhinolaryngologic diagnosis was: "Fibrosis in the right vocal fold, glottic cleft of the irregular type, with phase asymmetry and amplitude, besides subglotte edema and retraction of the anterior portion of the right vestibular fold".

Upon completion of therapy, the patient was referred by the ENT physician for evaluation with a neurologist in order to perform laryngeal electroneuromyography due to suspicion of bilateral upper laryngeal nerve palsy secondary to thyroid surgery.

The pre and post-speech images were edited and subsequently evaluated in consensus and simultaneously by three ORL judges, with experience in laryngology of at least five years, using a 10 cm analogical scale (the number of millimeters marked on the scale was converted in percent) for the aspects: mucosal vibration amplitude, constriction of the laryngeal vestibule (medial, anteroposterior, global), vibration symmetry and presence of mucosal wave.

Auditory perceptual voice assessment: performed based on TMF /a/, through RASATI auditory perceptual evaluation scale, which evaluates noise, roughness, breathiness, asthenia, tension and instability. This assessment was performed individually and separately for three years. The scale used for the elaboration of a proposal with the objective of "0", "1", "2" and "3", however as a current literature has indicated a great advance in the evaluations that are used of analogical-visual scales, it was decided to carry out an adaptation in the original protocol. Thus, the parameters for RASATI scale were used, but with an analog scale scale of 10 cm, where zero equals the absence of a parameter and 10 at different extremes (the number of millimeters marked in the scale was done in percentage). For purposes of outcome, it was considered the evaluation of the three judges.

It is noteworthy that all the judges of the research were blinded regarding the purpose and moment of the different evaluations (pre and post-speech therapy), knowing only the age and sex of the patient.

Therapy

The pre-therapy evaluation was performed on a Friday, after one week of use of the voice in the professional environment, and the speech therapy began on the same day, lasting 15 days, with an interval of two days (Saturday and Sunday) per week. Post-therapy evaluation was performed after the fifteenth therapy session that occurred on a Thursday

The sessions were carried out by different therapists (speech therapists or academicians of the Speech Therapy course) previously trained, who took turns in the consultations.

Each session of therapy had the following structure: execution of FK technique, performing a sonorized blow, with rounded lips (similar to the emission of the vowel /u/) in habitual loudness and pitch, avoiding inflating the cheeks or hypertension to the lingual musculature. At the same time, the index finger should be positioned vertically on the lips, touching them lightly, but without pressure.

A secondary friction noise should be produced by the contact of the airflow with the index finger.

Each emission of the technique was performed in TMF and C. performed six sets of 15 repetitions of FK technique. At the end of each series, the patient had a one minute passive rest interval (absolute silence). Throughout the session, water was available to be freely ingested due to the large airflow involved in FK technique.

During the performance of the technique, C. remained seated, with his\her feet resting on the floor, an erect spine with no cervical dislocation, with a 90o (ninety degrees) angle between the chin and the neck, without increasing the muscular contraction of the scapular girdle and suprahyoid region, maintaining The constant rhythm between one repetition and another, without making use of the expiratory reserve. Also, fluctuation or variability of pitch and/or loudness was controlled, which should be avoided. One therapist remained monitoring these aspects throughout each session.

C. was instructed to perform the technique only in the sessions, without home training, in order to avoid its execution without the monitoring of the therapist.

Results

Table 1 shows the values of the aerodynamic measurements, both before and after therapy.

Table 2 presents the acoustic vocal analysis results through MDVPA program in the pre- and post-therapy moments.

In Table 3, the values of the protocols of quality of life and voice can be visualized in the moments before and after therapy.

Table 4 shows the broadband and narrowband spectrographic acoustic vocal parameters at the pre- and post-therapy moments.

In Table 5, the results of auditory perceptive vocal evaluation can be visualized at the pre- and post-therapy moments.

Table 6 shows the results of videolaryngostroboscopic evaluation in the pre- and post-therapy moments.

Table 1. Descriptive results of aerodynamic measurements

Measurements	Pre-therapy	Post-therapy	Waited time
TMF /a/(s)	12,5	16,64	15 a 25
TMF /i/(s)	11,42	17,74	15 a 25
TMF /u/(s)	11,8	16,74	15 a 25
TMF /s/(s)	7,43	14,87	15 a 25
TMF /z/(s)	8,2	14,56	15 a 25
TMF /e/(s)	11,4	16,44	15 a 25
TMF /ė/(s)	7,95	21,34	15 a 25
Relation s/z	0,9	1,1	0,8 a 1,2
Relation ė/e	0,69	1,29	0,8 a 1,2
CV(ml)	3650	3650	2600
NPS modal (dBA)	69	62,4	-
TMFO(s)	12,5	16,64	18,61
TMFP(s)	18,61	18,61	18,61
TMFO/TMFP	0,76	0,9	0,9 a 1,1
CFS(ml/s)	292	219,35	105 a 256

Subtitle: TMF: maximum phonation time; CV: vital capacity; NPS: sound pressure level; TMFO: maximum phonation time obtained; TMFT: maximum phonation time predicted; CFS: simple phonic coefficient; -: there is no normal value.

Table 2. Descriptive analysis of quality of life and voice protocols

Protocol	Pre-therapy	Post-therapy	Maximum score	Cut score
EHAD anxiety	12,00	10,00	21	11
EHAD depression	8,00	4,00	21	11
QVV socioemotional	43,75	56,25	100	90,65
QVV physical	45,8	50	100	89,6
QVV total	45	57,5	100	91.25
IDV total	59,00	56,00	120	19
IDV functional	21,00	20,00	40	7,5
IDV organic	20,00	25,00	40	10,5
IDV emotional	18,00	11,00	40	3
PPAV total	200,00	115,00	280	4,5
PPAV self-perception of the voice problem	8,00	9,00	10	-
PPAV work effects	10,00	2,00	40	-
PPAV effects of daily communication	84,00	57,00	120	-
PPAV effects of social communication	31,00	6,00	40	-
PPAV effects of emotion	67,00	41,00	70	-
ESV total	90,00	76,00	120	16
ESV limitation	39,00	47,00	60	11,5
ESV emotional	23,00	8,00	32	1,5
ESV physical	20,00	18,00	28	6,5
Positive sensations	0	2	-	-
Negative sensations	12	12	-	-

Subtitle: EHAD: Hospital Anxiety and Depression Scale; QVV: Quality of Life in Voice; IDV: Vocal Disadvantage Index; PPAV: Vocal Participation and Activity Profile; ESV: Vocal Symptom Scale; -: there is no cut-off point or maximum score

Table 3. Descriptive analysis of acoustic measurements with *Multi-Dimensional Voice Program Advanced (Kay Pentax®)*

Parameterrr	Pre-therapy	Post-therapy	Normality
f0 (Hz)	118,82	75,6	243,973
fhi (Hz)	150,43	78,13	252,724
flo (Hz)	69,41	72,47	234,861
STD (Hz)	42,08	1	2,722
Jita (ms)	166,05	107,35	26,927
Jitt (%)	1,76	0,81	0,633
RAP (%)	1,08	0,45	0,378
PPQ (%)	1,26	0,53	0,366
sPPQ (%)	7,27	0,99	0,532
vf0 (%)	35,41	1,32	1,149
ShdB (dB)	0,77	0,9	0,176
Shim (%)	8,99	10,44	1,997
APQ (%)	6,83	8,95	1,397
sAPQ (%)	9,54	13,56	2,371
vAm (%)	18,46	24,95	10,743
NHR	0,16	0,18	0,112
VTI	0,02	0,06	0,046
SPI	13,31	7,8	7,534
DVB (%)	0	0	0,200
NVB (%)	0	0	0,200
DUV (%)	7,76	10,34	0,200
NUV	9	12	0,200
DSH (%)	4,67	0	0,200
NSH	5	0	0,200

Subtitle: f0: fundamental frequency; Fhi: maximum fundamental frequency; Flo: minimum fundamental frequency; STD: Standard deviation of fundamental frequency; Jitta: absolute jitter; Jitt: percentage or relative jitter; RAP: Relative mean of pitch disturbance; PPQ: pitch or frequency disturbance quotient; SPPQ: Disturbance quotient of pitch or smoothed frequency; Vf0: Variation of fundamental frequency; ShdB: Absolute Shimmer; Shim: Percentage or relative shimmer; APQ: Amplitude disturbance quotient; SAPQ: Smoothing amplitude disturbance quotient; VAm: Variation of amplitude; NRH: Noise-harmonic ratio; VTI: Vocal turbulence index; SPI: Soft phonation index; DVB: Degree of vocal breaks; NVB: Number of vocal breaks; DUV: Number of non-voiced segments; NUV: Degree of non-voiced segments; DSH: Degree of subharmonic components; NSH: Number of subharmonic segments.

Table 4. Descriptive analysis of the spectrographic acoustic vocal data obtained by *Real Time Spectrogram program (Kay Pentax®)*

Broad band (%)	Pre-therapy	Post-therapy	Limited band (%)	Pre-therapy	Post-therapy
Blackout stroke F1	50	60	Blackout stroke low and médium f	60	60
Blackout stroke F2	60	50	Blackout high f	20	20
Blackout stroke F3	30	30	Low and médium noise f	60	60
Blackout stroke F4	20	20	High noise f	30	20
Blakcout stroke of high f	20	20	Substituition of h by low and médium noise f	50	50
Blackout stroke of of low and médium f	50	50	Substitution of h by high noise f	30	20
Low and medium noise of f	70	60	Definition oh h in low and medium f	40	30
Noise in high f	50	40	Definition of h in high f	20	10
Definition of F1	30	50	Regularity of track in low and medium f	40	40
Definition of F2	40	40	Regularity of track in high f	20	10
Definition of F3	20	3	Number of h in low and medium f	50	50
Definition of F4	10	20	Number of h in high f	20	20
Regularity of track	60	50	Presence of sub-h	0	0

Subtitle: F: formante; f: frequence; h: harmonic

Table 5. Descriptive analysis of auditory perceptual characteristics by RASATI scale.

Parameter (%)	Pre-therapy	Post-therapy
Hoarseness	53,33	30
Roughness	28,33	21,66
Soprosity	26,66	20
Asthenia	3,33	3,33
Tension	30	0
Instability	15	5

Table 6. Descriptive analysis of the videolaringoestroboscopic evaluation.

Parameter (%)	Pre-therapy	Post-therapy
Vibration amplitude of the mucosa	60	80
Medial constriction of laryngeal vestibule	100	0
Anteroposterior constriction of laryngeal vestibule	0	0
Global constriction of the laryngeal vestibule	0	0
Symmetry of vibration	0	0
Presence of mucosal wave	50	50

Discussion

After TBI with FK, there was an increase in MFF of vowels, fricatives and /ė/ (Table 1), which may be related to both respiratory and phonological level improvement and their integration.

During the execution of FK, it is necessary to maintain the airflow, without increasing the tension in the previous vocal. Along with this, it is possible that the FK influences a respiratory musculature, with improvement not controlling its progressive relaxation during an emission. This was evidenced by the increase in the value of TMF, emphasizing the increase of /ė\ and of the voiceless fricative \s\ that do not use the glottal source (Table 1).

The increase of the other TMFs demonstrates a greater pneumophonic coordination acquired by the patient, possibly due to the improvement of air support and the modifications generated by the technique, according to the literature, such as increased muco-undulatory movement, improved vocal fold vibration synchrony and increased contact of the mucosa with less effort, which is corroborated by the results obtained in the acoustic analysis in relation to the decrease of all measures of jitter and of the measures NHR, SPI, DSH and NSH, related to the presence of noise to the emission (Table 3).

Research with the Stemple and Gerdeman's Vocal Functional Exercises Program was carried out with 17 teachers, lasting eight weeks, with a weekly meeting. It was verified that all the participants presented an increase in MFT, so that six presented values within the norms of normality at the moment after the therapy and the others presented values between ten and 14 seconds. In this study, all TMFs were below normal Expected for females from 15 to 25 seconds, after speech therapy, all increased above 14 seconds (Table 1).

In keeping with the present results, an article on TBI (nine sessions in three weeks) with ten women with vocal nodules showed augmentation of the TMF /a/. It should be noted, however, that the research cited also used respiratory exercises during the therapy. Study respiratory exercises were not used in the present, so that improvements over the respiratory level are due only to the effects of FK.

The CFS decreased, and the TMFO/TMFP ratio (Table 1) increased, presenting a value within the normal range of 0.9 to 1.1. The literature reports that the joint interpretation of the aerodynamic data and such results infer a decrease in aerial leakage to phonation in the reevaluation. Thus, it is possible that the patient improved her pneumono-articular coordination with the proposed therapy.

In MDVPA, it was observed an improvement in frequency measurements, such as reduction of f0 STD, increase of flo and reduction of fhi, which shows reduction of f0 variability, decrease of all measures of Jitter, SPI, NSH and DSH (Table 2). This may have occurred due to increased periodicity and stability of the vocal signal and the neuromuscular control caused by FK. These results are similar to those of a recent study that verified the effect of a therapy session using FK in teachers with and without laryngeal affection (LA) and showed reduction of frequency measures (fhi), Jitter (sPPQ), Shimmer (Shim and APQ) and vocal cords (NVB) in the non-LA group after a FK session. In the AL group, one therapy session was not sufficient to generate significant modifications in the acoustic analysis.

In another investigation, FK technique was performed in three sets of 15 replicates, by 46 women without LA and without vocal complaints. After execution, there was a decrease in noise, increase of f0, vocal stability and harmonic energy.

Other studies, which performed a TBI modality in patients with vocal nodules, although using other vocal techniques, also showed positive results such as a significant reduction of jitter and shimmer measurements and an increase of f0 8,9, in addition to reduction of NHR.

In relation to the spectrographic acoustic vocal analysis, it was verified, in the EBL, improvement in the darkening of F1 tracing, in low, medium and high frequency noise and in the definition of F1 and F4. In EBE, there was improvement of the noise in the high frequencies and the substitution of harmonic by noise in the high frequencies (Table 4). These results partially evidenced the decrease of the aperiodic energy and increase of the harmonic energy, with improvement of the vocal resonance of the patient, although also a decrease in the definition of low, medium and high frequency (EBE) and F3 (EBL), decrease of the regularity of the trajectory in the high frequencies (EBE) and of the whole trajectory (EBL) and decrease of the darkening of F2 (EBL). These aspects partially agree with research that verified the immediate effect of FK in women without dysphonia. In the mentioned study, there was an improvement in the intensity of the darkening of the tracing of the formants (F) and of the high frequencies, regularity of the tracing and definition of harmonics, besides improvement in the vocal self-assessment, as the intensity of blackening of F3 tracing of the definition of the trace, the number of harmonics and reduction of the harmonic substitution by noise in the medium frequencies.

Prior to the therapy, the patient had no positive feelings about her voice and then referred to two positive sensations (voice to speak and sense of projection in the voice), while maintaining the other negative sensations that she had previously mentioned. This result is partially in line with many studies with ETVSO, in which patients report improvement in their vocal self-perception.

In a study of four phonation exercises in tubes performed with 24 dysphonic subjects, a self--report protocol of vocal sensations was used, and positive sensations were predominant, such open throat sensation, greater vocal stability and more relaxed muscles. Other sensations referred to in studies with ETVSO include a cleaner, clear, firm, secure, open, balanced, loose, velvety, soft voice and more natural voice; Easier and better voice; loose voice to speak, improved voice projection and looser muscles.

Analyzing the results of quality of life and voice protocols, the patient reported improvement in quality of life in most aspects of the protocols, agreeing with laryngeal improvements, acoustic and auditory perceptual after three weeks of therapy. However, the "organic" domain of IDV, the "self-perception of the voice" of PPAV and the "limitation" of ESV, have worsened. The organic domain of IDV focuses on specific aspects of vocal production, on how unpredictable the patient's voice is, the discomfort generated and the effort required to convey the message in a clear and intelligible manner, similar to the items of the aspect limitation of ESV. These aspects and self-perception of voice were likely to interfere most with the patient's quality of life, and because of the limitations that her laryngeal diagnosis required, the results of the therapy may not have met the patient's expectations in such aspects. Thus, it is confirmed what is pointed out in the literature about the fact that, although there is a significant correlation between the degree of dysphonia and the low quality of life in voice, vocal disorders influence the quality of life of each individual in a particular way. The quality of life and voice protocols complement each other and this justifies the importance of their joint application in order to obtain more complete data regarding the limitations that dysphonia causes to the patient. In the EHAD, the scores suggestive of depression were in a discrete degree and went into the normal range and the anxiety scores were above the cut-off point for clinical cases, decreasing after therapy. It is emphasized that the patient was already in specialized care and maintained it throughout the speech therapy, so that it is not possible to establish if this improvement in the scores, suggestive of depression and anxiety, occurred due to "feeling cared for" with BIT with FK, due to psychiatric treatment or both.

In the other protocols, all aspects showed values still referring to dysphonia before and after therapy, although the majority showed improvement after three weeks of treatment. Together with this, it can be verified how much the presence of the patient's LA, despite having improved in ENT examination, still interfered in the quality of life after therapy. This aspect may vary among individuals, that is, the improvement obtained in the present study with other subjects could have evidenced better or worse self-assessment results, depending on the importance of oral communication for each one, as well as the demand that each profession requires. In this sense, the application of the protocols provides important information that differ in each sample studied and are fundamental to understand the limitations imposed by dysphonia for each individual subject.

In the auditory perceptual vocal evaluation, all aspects evaluated were improved, except for asthenia, which presented less than 4% in both evaluation and revaluation (Table 5). This result was in agreement with research with dysphonic teachers who showed improvement of the breathability and instability in the group that did not present LA and improved instability in the LA group after a single session with FK. In addition, with subjects without dysphonia, research showed a percentage decrease in vocal instability immediately after a session with FK. Another study, in which the patients performed only one minute of training with the FK, did not show any modifications in the auditory perceptual evaluation. Using other vocal techniques, other studies have shown improvements in auditory perceptual aspects in patients with structural affections in the larynx using TBI modality, as well as in other modalities of therapy.

It is important to note that hoarseness and tension were the two parameters with the greatest difference between pre- and post-speech therapy, and a relationship between decreased hoarseness, decreased acoustic noise and jitter measurements (Table 3) and between the decrease of tension with the increase of measures of shimmer, VTI, DUV and NUV that suggest less force of glottal closure or less contact between the vocal folds during phonation.

As for the videolaryngostroboscopic evaluation aspects, there was an improvement in the vocal fold mucosal vibration amplitude, which is related to the reduction of the parameters of hoarseness, breathiness and roughness obtained, as well as acoustic noise and jitter measurements, and reduction of medial constriction of the laryngeal vestibule (Table 6), which is related to the decrease in tension and the increase of shimmer, VTI, DUV and NUV measurements as well as the various improvements in several domains of vocal self-assessment protocols.

It is important to note that in the revaluation of the ENT, the physician decided to refer the patient for laryngeal electroneuromyography examination, due to the suspicion of bilateral paralysis of the

superior laryngeal nerve, secondary to thyroid surgery. This suspicion could explain the lowered values of f0 found both in the evaluation and in the revaluation (Table 2), since without function of the cricothyroid muscles, innervated by the superior laryngeal, f0 becomes diminished.

In spite of the evident improvements after TBI with FK, it is important to reiterate that the patient presented organic dysphonia with irreversible structural alteration of the glottic source and that her dysphonia remained present, although diminished/minimized after the therapy chosen and the technique used. Thus, it was not expected that all the values of their objective and subjective evaluations would pass into the normal range, but would be adequate enough so that the patient could feel better both socially and professionally, according to his self-evaluations.

Conclusion

After a TBI program with the FK technique in a patient with organic dysphonia due to fibrosis in the right vocal fold, a glottic cleft of the irregular type, with asymmetry and amplitude phase, besides subglotted edema and retraction of the anterior portion of the right vestibular fold, due to orotracheal intubation, there were positive vocal changes at glottic, respiratory and ressonantal levels, as well as videolaryngostroboscopy and vocal self-assessment, evidencing that this was an effective treatment modality for the case.

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Annex 1

Questionnaire on subjective sensations regarding voice

Name: _____ Date:_____

VOICE FEELING:
( ) Clear/spoken voice to speak
( ) Realizes projection in the voice
( ) Sensation of secretion in throat and throat
( ) Feeling of a foreign body in the throat
( ) Dry mouth and/or throat
( ) thin voice
( ) Thick voice
( ) Weak voice
( ) Voice failures
( ) Fatigue to speak
( ) Pain to speak
( ) 'Dirty' voice
( ) Loose muscles
( ) Tense muscles
( ) Noise in the voice
( ) Pain to speak
( ) Voice tired at the end of the day
( ) Frequent voice loss

OTHER FEELINGS:
_____
_____