JOURNAL OF OTOLARYNGOLOGY: RESEARCH Open Access

SCIENTIFIC LITERATURE

RESEARCH ARTICLE

Voice Professionals Undergoing Polyp Surgery: What is the Complete Vocal Recovery Time

Guilherme Simas do Amaral Catani[1*], Rosana Yurika de Freitas Kondo[2], Evaldo Dacheux de Macedo Filho[1] and Caroline Fernandes Rimoli[3]

[1]Department of Otorhinolaryngology, Federal University of Parana, Brazil
[2]Department of Otorhinolaryngology, University of Ribeirao Preto, Brazil
[3]Department of Otorhinolaryngology, IPO Hospital, Brazil

ARTICLE INFO

Article history:
Received: 20 October 2017
Accepted: 24 January 2018
Published: 01 February 2018

Keywords:
Larynx;
Polyps;
Microsurgery

Citation this article: do Amaral Catani GS, de Freitas Kondo RY, de Macedo Filho ED, Rimoli CF . Voice Professionals Undergoing Polyp Surgery: What is the Complete Vocal Recovery Time. J Otolaryngol Res. 2018; 2(1):119.

Correspondence:
Guilherme Simas do Amaral Catani, Department of Otorhinolaryngology, Federal University of Parana, Brazil,
Email: gscatani@gmail.com

ABSTRACT

Introduction: the voice is an important element for an individual in his personal and professional relationships. Through it we are able to convey a message and carry on communication. Those who are called voice professionals use it as a working tool and are classified into Koufman's levels. However, vocal fatigue may result from improper and strenuous use added to external elements and dysphonia due to phonotraumatic lesions, especially polyps, develops when use exceeds the compensatory mechanisms. Aim: to establish a secure parameter of required vocal rest time for functional and professional voice recovery after laryngeal microsurgery. Methods: 68 voice professionals at Koufman's levels I and II with vocal polyps who underwent laryngeal microsurgery were selected through objective variables and compared to 100 people with healthy voice from the preoperative moment up to 3 months postoperatively, based on an acoustic analysis with the shimmer, jitter, NHR and VPQ variables. Results: all variables at 1-month postoperatively were seen to be adequate within normal limits. Conclusion: after surgical correction of polyps, we found that 1-month vocal rest is needed for complete and safe vocal recovery.

Introduction

As an essential personal element when conveying a message, the voice has its development from birth to the complete anatomical maturation of the vocal organ, which defines it as an important element in interpersonal, social and professional relationships [1].

It is even more relevant for those who use it as an occupational tool [2].

Based on the connection between jobs and the use of voice and taking into account the demand and importance of the voice for the professional practice, Koufman developed a classification in which occupations are divided into four levels: [3].

- Level I – elite vocal performer (singers and professional actors);
- Level II – professional voice user (teachers, lecturers, clergy);
- Level III – non-vocal professionals (businesspeople, doctors, lawyers);
- Level IV – non-vocal nonprofessionals (computer programmers, factory workers).

Among the occupations at levels I and II, strenuous voice demands reach the functional capacity of vocal organs while creating adjustments. When that compensatory mechanism reaches its limit, dysphonic symptoms arise such as vocal fatigue, voice quality fluctuations and loss of voice power and volume, which hinder a person's verbal and emotional communication abilities [3].

Apart from organic disorders, dysphonia may cause psychological disorders, difficulties in social and personal relationships, while negatively impacting quality of life. It is a multi factorial condition that should be analyzed within the context and environment where it occurs [4]. Studies have shown that excessive noise, dust, air conditioning and carpets deteriorate the quality of teachers' voice, as well as ventilation and poor cleaning of classrooms [5].

Work-related dysphonia, in particular, varies according to degree and complexity [6].

In the face of a dysphonia scenario, it is necessary to proceed with etiological and morphological investigations, as well as grading of its severity in order to create safe parameters for treatment [7].

For some laryngeal diseases, non-surgical treatment is recommended with exercises that will improve voice functional capacity and the vocal lesion. However, if traditional treatment in itself is either not enough or not advised (malignant lesions, acute hemorrhagic lesions, among others), then surgical intervention is needed [7].

According to the literature, the recovery time for the professional voice after microsurgery of the larynx due to phonotraumatic lesion is yet to be well established, especially for the most frequent etiology: vocal cord polyps. Polyps are phonotraumatic lesions with exophytic appearance, mostly unilateral, sessile or pediculated with gelatinous, fibrous or angiomatous appearance [8].

There is evidence that singers should recover for a period of 2 to 3 months with the possibility of taking up to a year to feel comfortable with their voice. In most severe cases, patients may require years of rehabilitation [9].

In this study we tried to establish a parameter of the vocal rest time needed for functional and professional recovery of the voice after microsurgery of the larynx, while looking at polypoid phonotraumatic lesions in voice professionals of economically active age.

Materials and Methods

This is a prospective study that analyzed voice professionals at Koufman's Levels I (vocal elite) and II (professional voice user) who were diagnosed with vocal fold polyps after being examined by laryngologists at the IPO Hospital in the city of Curitiba from January 2013 to January 2015. [3] The research project was approved by IPO Hospital's Ethics Committee for Human Research under No 0018/2013. The study included nonsmoking patients from 18 to 65 years of age at Koufman's levels I and II with vocal fold polyps comprising group 1.3 for comparative reasons, there was a control group consisting of 100 nonsmoking people, half of each gender, without larynx lesions.

Patients underwent the following analyses:

- Completion of the Vocal Performance Questionnaire (VPQ) in Brazilian Portuguese [10];
- Vocal Acoustic Analysis with measurement of the following parameters:
- Jitter (%): it evaluates the frequency cycle by cycle and it is related to roughness. Reference value: lower or equal to 1.040% [11].
- Shimmer (%): it evaluates the amplitude, it is related to hoarseness and it is accurate in the description of the vocal features of normal and dysphonic speakers. Reference value: lower or equal to 3.810% [11].
- Noise Harmonic Ratio (NHR): it is higher for women between the ages of 21 and 63, but not sensitive to distinguish normal voice from dysphonia. Reference value: higher than 20 [11].
- Video laryngoscopy (Graph 1 & 2).

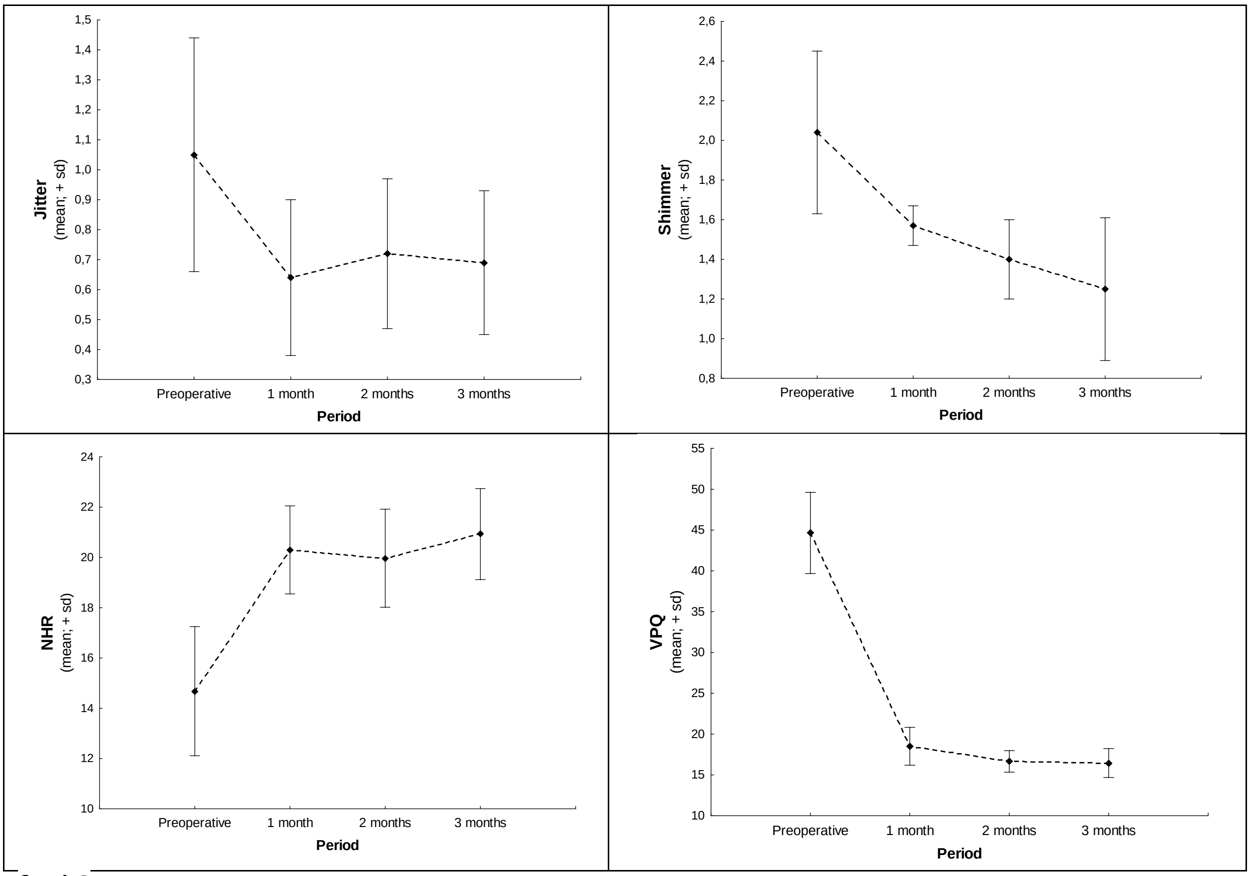
Questionnaire completion, vocal acoustic analysis and video laryngoscopy examination were carried out throughout four different moments: one day before surgery, on the 30th, on the 60th and on the 90th day postoperatively.

The acoustic analysis was performed in an acoustically treated room with the Praat software [12]. A Shure SM

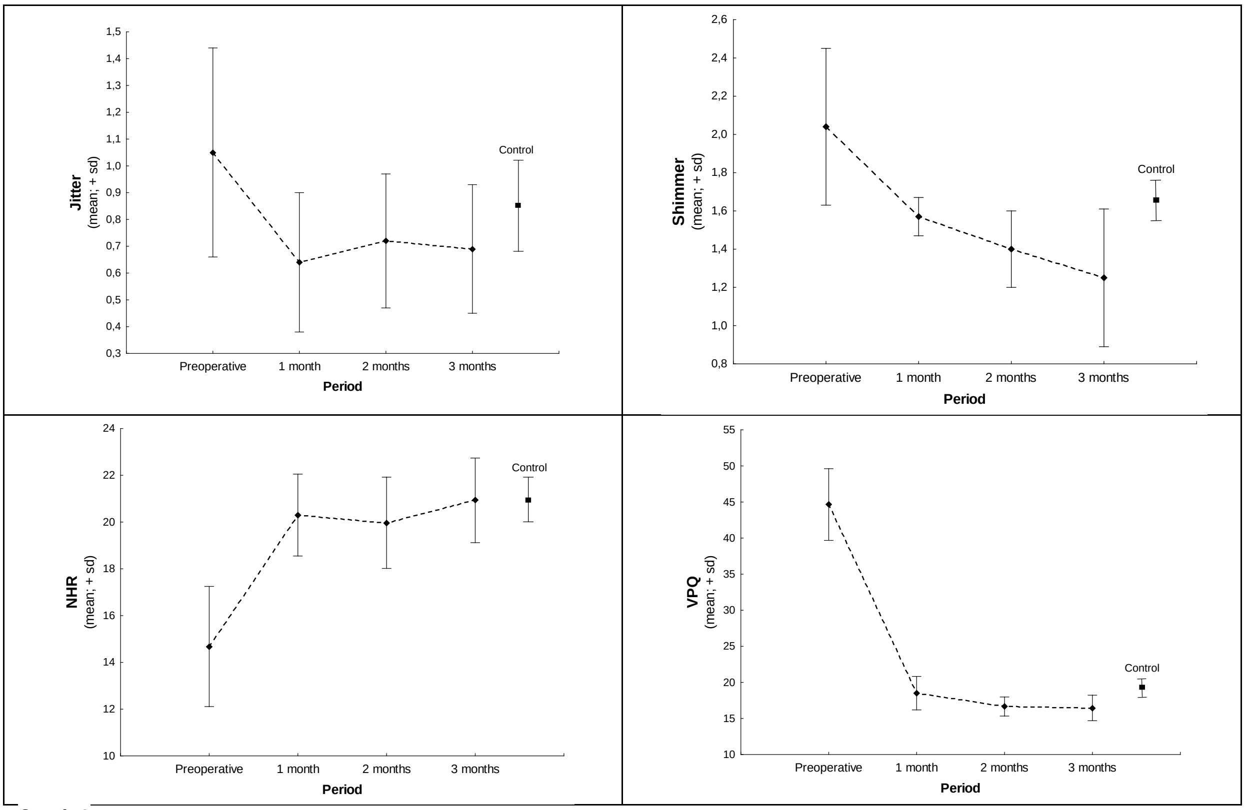
SCIENTIFIC LITERATURE

48 dynamic microphone was used and kept at a fixed distance of 5 centimeters from the patient's mouth.

Vocal samples were gathered during the sustained emission of the /a/ vowel, while keeping height and intensity at comfortable levels.



Graph 1
sd: standard deviation



Graph 2
sd: standard deviation

Both first and both final seconds of each sample were disregarded. Video laryngoscopic examinations were performed under topical anesthesia with lidocaine 10%, a telescope for cooperative patients and nasofibroscope for the others, as well as the following equipment:

- 7mm Rigid Laryngeal Telescope at 70° (STORZ).
- 3.2mm Flexible nasofibrolaryngoscope (MACHIDA ENT 32).
- 250 watts light source.
- Micro camera (ASAP).
- DVD recorder (SONY).
- Video monitors (LG 22 inches).

Surgeries were performed at IPO Hospital's Surgical Center with suspension laryngoscopy.

Patients were intubated with an endotracheal tube (5.5 to 6.0 mm diameter) under general anesthesia. Subsequently, with the patient in dorsal decubitus without any pillows we inserted the universal suspension Dan laryngoscope size 18 cm length, 2 cm height and 1.5 cm width.

The materials used in the surgery were the following: microscope (ZEISS PICO), 400 mm objective lens coupled to the micro camera, 42-inches LG video monitors, rigid laryngoscopes with laryngeal clamps and micro-tweezers.

Microsurgeries were performed through the cold technique. In no case was laser used.

All patients were advised to have an eight-day vocal rest and subsequently referred to at least eight speech therapy sessions.

Statistical Analyses Quantitative variables were expressed as the statistical mean, median, minimum value, maximum value and Standard Deviation (SD). The Student's t-test was used to determine significant differences. Differences with p-values <0.05 were considered significant.

Results & Discussion

Sixty eight patients completed the four stages of data collection. There is a higher number of women who underwent microsurgery of the larynx, which is compatible with previous studies [13]. Average age was 35.4 years. Angiomatous polyps were the most frequent ones with 39 cases (54.9%). Such findings were compatible with previous studies [14,15].

Phonotraumatic lesions, which are common in our practice, clinically appear in various forms depending on patient's response to the aggression. Elements such as glottic configuration and exposure to chemicals and allergens have already been described to explain the formation of different types of lesions. Recent studies have discussed the different amount of fibronectin and hyaluronic acid in the vocal folds of men and women, which also seem to explain the higher prevalence of nodules in females and polyps in males [16,17].

This study has shown higher incidence of polyps in males, with 38 cases (55.8%), which is according to the literature [18-20].

In the preoperative evaluation, we observed great alterations in the acoustic analysis measurement, as well as in the score of the vocal performance questionnaire.

As for the acoustic evaluation, which is useful to complement both vocal evaluation and speech production, there are several parameters to be studied. The most common ones are: fundamental frequency, jitter, shimmer and NHR [21]. Other than the fundamental frequency, those parameters were compared between group 1 and the control group from the preoperative moment up to 3 months postoperatively, as shown on (Table 1).

The measurements of frequency and amplitude variation cycle by cycle in the emission of sustained vowels, jitter and shimmer respectively, have proved to be useful in the description of the vocal features of normal and dysphonic speakers and are related to roughness and hoarseness respectively [21].

The NHR characterizes the relationship between both components of the acoustic wave of a sustained vowel: the periodic component, which is the regular sign of the vocal folds, and the additional noise coming from the vocal folds and the vocal tract.

As it can be seen on (Table 2) through the jitter variable, group 1 values in the preoperative moment were different from the control group and from the results in the literature [13]. In the1-month moment, the results for group 1 were already considered normal and remained so up to the final 3-month moment. There was no significant statistical difference between the 1-month and the 2-monthsmoments neither between the 2-months and the 3-months moments.

In the evaluation of the shimmer variable, as shown on (Table 3), group 1 values in the preoperative moment were different from the comparison group and from the results in the literature [12].

Table 1: Statistical comparison of vocal analysis and VPQ variables: group 1 x control group.

Period	Variables	n	Average	Standard Deviation	Minimum	Median	Maximum
Preoperative	Jitter	68	1.05	0.39	0.09	1.06	2.18
	Shimmer	68	2.04	0.41	1.22	2.06	3.07
	NHR	68	14.68	2.57	10.45	14.17	22.76
	VPQ	68	44.65	4.97	35.00	45.00	52.00
1 month postoperatively	Jitter	68	0.64	0.26	0.08	0.63	1.31
	Shimmer	68	1.57	0.10	1.35	1.57	1.83
	NHR	68	20.30	1.75	11.72	20.59	23.73
	VPQ	67	18.51	2.32	15.00	18.00	24.00
2 months postoperatively	Jitter	68	0.72	0.25	0.00	0.78	1.21
	Shimmer	68	1.40	0.20	1.01	1.41	1.72
	NHR	68	19.97	1.95	10.67	20.41	22.40
	VPQ	68	16.66	1.32	14.00	17.00	19.00
3 months postoperatively	Jitter	68	0.69	0.24	0.17	0.75	1.16
	Shimmer	68	1.25	0.36	0.18	1.31	2.01
	NHR	68	20.93	1.81	12.69	20.95	23.69
	VPQ	68	16.46	1.77	13.00	16.00	19.00
Control	Jitter	100	0.84	0.18	0.47	0.84	1.14
	Shimmer	100	1.66	0.11	1.18	1.66	1.83
	NHR	100	20.95	0.95	18.68	20.85	23.73
	VPQ	100	18.97	1.44	17.00	19.00	21.00

Table 2: Descriptive statistics of the Jitter variable.

Comparison	Estimated difference*	p-value	Confidence Interval (95%)	
1 month pre-post	0.41	<0.01	0.32	0.49
2 months pre-post	0.33	<0.01	0.24	0.41
3 months pre-post	0.36	<0.01	0.28	0.45
1 month post–2 months post	-0.08	0.07	-0.16	0.01
1 month post – 3 months post	-0.04	0.31	-0.13	0.04
2 months post– 3months post	0.03	0.42	-0.05	0.12
Control - pre	-0.21	<0.01	-0.29	-0.13
Control – 1 month post	0.20	<0.01	0.11	0.28
Control – 2-months post	0.12	<0.01	0.04	0.20
Control – 3-months post	0.15	<0.01	0.07	0.23

*Square root transformation was used in the response variable

Table 3: Descriptive statistics of the Shimmer variable.

Comparison	Estimated difference*	p-value	Confidence Interval (95%)	
1 month pre-post	0.47	<0.01	0.38	0.56
2 months pre-post	0.64	<0.01	0.56	0.73
3 months pre-post	0.79	<0.01	0.70	0.88
1 month post – 2 months post	0.17	<0.01	0.09	0.26
1 month post – 3 months post	0.32	<0.01	0.23	0.41
2 months post – 3 months post	0.15	<0.01	0.06	0.23
Control - pre	-0.38	<0.01	-0.46	-0.30
Control – 1 month post	0.09	0.03	0.01	0.17
Control – 2 months post	0.26	<0.01	0.18	0.34
Control – 3 months post	0.41	<0.01	0.33	0.49

* Square root transformation was used in the response variable.

Table 4: Descriptive statistics of the NHR variable.

Comparison	Estimated difference*	p-value	Confidence Interval (95%)	
1 month pre-post	-5.62	<0.01	-6.17	-5.08
2 months pre-post	-5.29	<0.01	-5.83	-4.75
3 months pre-post	-6.25	<0.01	-6.79	-5.71
1 month post – 2 months post	0.33	0.23	-0.21	0.87
1 month post – 3 months post	-0.62	0.02	-1.17	-0.08
2 months post – 3 months post	-0.96	<0.01	-1.50	-0.41
Control - pre	6.27	<0.01	5.71	6.82
Control – 1 month post	0.64	0.02	0.09	1.20
Control – 2 months post	0.97	<0.01	0.42	1.53
Control – 3 months post	0.02	0.95	-0.54	0.57

Table 5: Descriptive statistics of the VPQ variable.

Comparison	Estimated difference*	p-value	Confidence Interval (95%)	
1 month pre-post	26.14	<0.01	25.26	27.03
2 months pre-post	27.99	<0.01	27.10	28.87
3 months pre-post	28.19	<0.01	27.31	29.07
1 month post – 2 months post	1.84	<0.01	0.96	2.73
1 month post – 3 months post	2.05	<0.01	1.16	2.94
2 months post – 3 months post	0.21	0.65	-0.68	1.09
Control - pre	-25.68	<0.01	-26.49	-24.86
Control – 1 month post	0.46	0.27	-0.36	1.28
Control – 2 months post	2.31	<0.01	1.49	3.12
Control – 3 months post	2.51	<0.01	1.70	3.33

In the 1-month moment, the results for group 1 were already considered normal and remained so. There was a significant statistical difference between the 1-month and 2-months moments and between the 1-month and 3-months ones, while the difference between the 2-months and 3-months moments was not significant.

In the evaluation of the NHR variable shown on (Table 4), group 1 values in the preoperative moment were different from the control group and from the results in the literature [12]. In the 1-month moment, the results for group 1 were already considered normal as the other ones. There was a significant statistical difference only between the preoperative vs. 1-month moments, and not significant between the 1-month vs. 2-months and 2-months vs. 3-months moments [22].

As for the VPQ, there was a great difference in the score in the preoperative evaluation. In this study, the VPQ average for patients in group 1 was 44.65, which shows a great vocal impact in this type of phonotraumatic lesion. In group 1, we observed an improvement in the VPQ score already in the first month postoperatively: numbers reach those of the control group (18.51 in group 1 and 18.97 in the control group), and keep falling in the subsequent 2 months postoperatively, as shown on (Table 5). It isn't possible to compare the results gathered with other studies, because there are no similar studies available in the literature.

The measurement of quality of life as an evaluation method in the treatment of patients with dysphonia has increased. This makes possible to assess the effectiveness of the therapy, as well as to identify patients' preferences. One way to perform that evaluation is by giving a self-evaluation questionnaire with questions related to behavior, feelings and symptoms [15,23,24].

The VPQ facilitates the study of the impact of a voice problem in the quality of life of dysphonic individuals. In big populations with vocal complaints, the use of protocols that evaluate the quality of life related to voice, such as the VPQ, may provide the identification of details in the perception of the impact caused by the dysphonia according to gender, age group and professional vocal use. In the VPQ validation in Brazil, Paulinelli et al. gave this questionnaire to 165 people with no vocal complaints and reported an average score of 19 points, which is similar to our control group [11].

By observing the data from the acoustic analysis and the VPQ, we see the positive correlation of those parameters in the moments studied. This way, we may infer that the VPQ can be used as a sole parameter of vocal evaluation when acoustic analysis is not available.

Conclusion

Given the aforementioned arguments and data, we have determined that one month is the necessary period of time for complete vocal recovery after a microsurgery of the larynx due to vocal polyps in voice professionals.

References

1. Catani GS, Hamerschmidt R, Moreira AT, Timi JR, Wiemes GR, et al. (2016). Subjective and objective analyses of voice improvement after phonosurgery in professional voice users. Med Probl Perform Art. 31: 18-24.

2. Silva MSB. (2012). Considerações periciais acerca da voz enquanto instrumento de trabalho. Ed. Goiânia: Revista Especialize On Line.

3. Koufman JA. (1991). Approach to the patient with a voice disorder. Otolaryngol Clin North Am. 24: 989–998.

4. Ortiz E, Costa EA, Spina AL, Crespo AN. (2004). Multidisciplinary protocol proposal for professional dysphonia: preliminary study. Rev Bras Otorrinolaringol. 70: 590-596.

5. Araújo TM, Reis EJ, Carvalho FM, Porto LA, Reis IC, et al. (2008). Factors associated with voice disorders among women teachers. Cad Saude Publica. 24: 1229-1238.

6. Associação Brasileira De Otorrinolaringologia e Cirurgia Cérvico-Facial. (2004). 3° Consenso nacional sobre voz profissional; voz e trabalho: uma questão de saúde e direito do trabalhador. [publicação online]. Rio de Janeiro.

7. Martins RH, do Amaral HA, Tavares EL, Martins MG, Gonçalves TM, et al. (2016). Voice Disorders: Etiology and Diagnosis. J Voice. 30: 761e1-761e9.

8. Johns MM, Garrett CG, Ossoff RH, Hwang J, Courey MS, et al. (2004). Quality-of-life outcomes following laryngeal endoscopic surgery for non-neoplastic vocal fold lesions. Ann Otol Rhinol Laryngol. 113: 597–601.

9. Emerich KA, Baroody MM, Carroll LM. (1998). The singing voice specialist. In: Satal off RT (editors). Vocal Health and Pedagogy. San Diego, Singular Publishing Group. 315-334.

10. Paulinelli BR, Gama ACC, Behlau M. (2012). Validation of the Vocal Performance Questionnaire in Brazil. Rev. Soc. Bras. Fonoaudiol. 17: 85–91.

11. Adad AS, Marcos G, Carlos PJ, Oliveira RM. (2002). Normalization of acoustic measures of normal voice. Braz J Otorhinolar. 68: 540-544.

12. Boersma P. Praat, a system for doing phonetics by computer. Glot International. 5: 341–345.

13. Catani GSA. (2012). Use of an electronic data collection protocol for the evaluation of laryngoscopic alterations in patients submitted to laryngeal microsurgery. (Masters dissertation). Curitiba: Federal University of Parana.

14. Deary IJ, Wilson JA, Carding PN, MacKenzie K. (2003). VoiSS: a patient-derived Voice Symptom Scale. J. Psychosom. Res. 54: 483–489.

15. Lehmann W, Pampurik J, Guyot JP. (1989). Laryngeal pathologies observed in microlaryngoscopy. Otorhinolaryngol Relat Spec. 51: 206–215.

16. Kleinsasser O. (1974). Microlaryngoscopy and endolaryngeal microsurgery. II: A review of 2500 cases. HNO. 22: 69–83.

17. Gaston J, Thibeault SL. (2013). Hyaluronic acid hydrogels for vocal fold wound healing. Biomatter. 3: 1–7.

18. Mizuta M, Hirano S, Ohno S, Kanemaru SI, Nakamura T, et al. (2014). Restoration of scarred vocal folds using 5 amino acid-deleted type hepatocyte growth factor. Laryngoscope. 124: E81–86.

19. Tateya I, Tateya T, Watanuki M, Bless DM. (2015). Homeostasis of hyaluronic Acid in normal and scarred vocal folds. J Voice. 29: 133–139.

20. Carding PN, Wilson JA, MacKenzie K, Deary IJ. (2009). Measuring voice outcomes: state of the science review. J Laryngol Otol. 123: 823–829.

21. Williamson G. Objective Measurement of Voice.

22. Jacobson BH, Johnson AF, Grywalski C, Benninger MS. (1997). The voice handicap index (VHI): development and validation. Am. J. Speech Lang. Pathol. 6: 66–70.

23. Hogikyan ND, Sethuraman G. (1999). Validation of an instrument to measure voice-related quality of life (V-RQOL). J Voice. 13: 557–569.

24. Gliklich RE, Glovsky RM, Montgomery WW. (1999). Validation of a voice outcome survey for unilateral vocal cord paralysis. Otolaryngol Head Neck Surg. 120: 153–158.