

Relationship between vocal, acoustic and quality of life evaluation in women with the different grade of Reinke's edema

Relação entre avaliação vocal, acústica e qualidade de vida em voz de mulheres com diferentes graus de Edema de *Reinke*

Relación entre evaluación vocal, acústica y calidad de vida en voz de mujeres con diferentes grados de Edema de Reinke

*Juliana Benthien Cavichiolo**

*Paula Andressa Gnatkowski**

*Ana Paula Dassie-Leite***

*Eliane Cristina Pereira****

*Evaldo Macedo Filho****

*Guilherme Catani**

*Elmar Allen Fugmann**

Abstract

Introduction: *Reinke's* edema is characterized by a chronic inflammatory process that affects the superficial layer of the lamina propria of the vocal fold. Currently, its etiology is attributed to smoking associated with vocal abuse. **Objective:** To relate data of vocal, acoustic and quality of life evaluation in women with the different grade of *Reinke's* edema. **Method:** It is an observational, analytical and cross-sectional study. Participants were 22 women, aged between 45 and 78 years old (mean 58.3 years), who

*Hospital das Clínicas da Universidade Federal do Paraná - HC/UFPR, Paraná, Brazil

** Universidade Estadual do Centro Oeste – UNICENTRO, Paraná, Brazil

*** Prefeitura Municipal de Prudentópolis, Paraná, Brazil

Authors' contributions:

JBC – Idealization of the study, data collection, analysis and discussion of results; PAG – Analysis of results, elaboration of the final text, and text elaboration; APDL – Idealization of the study, data collection, analysis and discussion of the results; ECP – Analysis of results, elaboration of the final text, and text elaboration; EMF – Idealization of the study, contributions to the methodology and data analysis; GC – Idealization of the study, contributions to the methodology and data analysis; EAF - Idealização do estudo, contribuições à metodologia e análise de dados.

Correspondence address: Paula Andressa Gnatkowski paula_gnatkowski@hotmail.com

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passed by laryngology evaluation to observe the variables regarding of edema's degree and the association with other laryngeal disorders; auditory-perceptual evaluation of voice; acoustic voice data analysis; and vocal self-assessment by Voice-Related Quality of Life protocol (VRQOL). Laryngological data and vocal samples were analyzed by expert judges. Data were statistically analyzed. The subjects were grouped into two groups: Group 1 (G1) (grade 1 of edema) and Group 2 (G2) (grades 2 and 3 of edema). **Results:** G2 had worse results than G1 in all associations: more vocal symptoms; higher degree of vocal deviation in auditory-perceptual evaluation; more abnormal results in acoustic measurements (jitter, shimmer and glottal to noise excitation ratio; lower values in all domains of VRQOL, indicating worse quality of life. **Conclusions:** The laryngeal data related to the progression of *Reinke's* edema are directly related to worsening of auditory-perceptual and acoustic data of voice and a greater negative impact of dysphonia in quality of life.

Keywords: Laryngeal edema; Voice; Voice disorders; Smoking; Quality of life

Resumo

Introdução: O Edema de *Reinke* caracteriza-se por um processo inflamatório crônico que acomete a camada superficial da lâmina própria da prega vocal. Atualmente, sua etiologia é atribuída ao tabagismo associado ao abuso vocal. **Objetivo:** Relacionar os dados das avaliações vocal, acústica e de qualidade de vida em voz com o grau do Edema de *Reinke* em mulheres. **Método:** Estudo observacional, analítico, transversal e prospectivo. Participaram 22 mulheres, com idades entre 45 e 78 anos (média 58,3), que foram submetidas à avaliação laringológica para observação das variáveis referentes ao grau do edema e a associação com outras lesões e/ou alterações laringeas; avaliação perceptivo-auditiva da voz; análise acústica da voz; e auto avaliação vocal por meio do protocolo Qualidade de Vida em Voz (QVV). Os exames laringoscópicos e as amostras vocais foram analisados por juizes especialistas. Os dados obtidos foram analisados estatisticamente pelo teste de Mann-Whitney. Os sujeitos foram agrupados em dois grupos: Grupo 1 (G1) (edema grau 1) e Grupo 2 (G2) (edemas graus 2 e 3). **Resultados:** O G2 apresentou piores resultados do que o G1 quanto ao maior número de sintomas vocais; maior grau de desvio vocal na avaliação perceptivo-auditiva; resultados mais alterados nas medidas acústicas *jitter*, *shimmer* e proporção GNE; valores mais baixos em todos os domínios do QVV, indicando pior qualidade de vida. **Conclusões:** As características laringológicas referentes à progressão do Edema de *Reinke* estão diretamente relacionadas à piora dos parâmetros perceptivo-auditivos e acústicos da voz e a um maior impacto negativo da disfonia na qualidade de vida.

Palavras-chave: Edema laríngeo; Voz; Distúrbios da voz; Fumar; Qualidade de vida

Resumen

Introducción: El Edema de *Reinke* se caracteriza por un proceso inflamatorio crónico que acomete la capa superficial de la lámina propia del pliegue vocal. Actualmente, su etiología se atribuye al tabaquismo asociado al abuso vocal. **Objetivo:** Relacionar los datos de las evaluaciones vocal, acústica y de calidad de vida en voz con el grado del Edema de *Reinke* en mujeres. **Método:** Estudio observacional, analítico, transversal y prospectivo. En la mayoría de los casos, se observó un aumento de la mortalidad por rotavirus en el momento de la vacunación. evaluación perceptiva-auditiva de la voz; análisis acústico de la voz; y autoevaluación vocal a través del protocolo Calidad de Vida en Voz (QVV). Los exámenes laringoscópicos y las muestras vocales fueron analizados por jueces especialistas. Los datos obtenidos fueron analizados estadísticamente por la prueba de Mann-Whitney. Los sujetos fueron agrupados en dos grupos: Grupo 1 (G1) (edema grado 1) y Grupo 2 (G2) (edemas grados 2 y 3). **Resultados:** El G2 presentó peores resultados que el G1 en cuanto al mayor número de síntomas vocales; mayor grado de desvío vocal en la evaluación perceptivo-auditiva; resultados más alterados en las medidas acústicas *jitter*, *shimmer* y proporción GNE; valores más bajos en todos los ámbitos del QVV, indicando peor calidad de vida. **Conclusión:** Las características laringológicas referentes a la progresión del Edema de *Reinke* están directamente relacionadas con el empeoramiento de los parámetros perceptivo-auditivos y acústicos de la voz y un mayor impacto negativo de la disfonía en la calidad de vida.

Palabras claves: Edema laríngeo; Voz; Trastornos de la voz; Fumar; Calidad de vida

Introduction

Reinke's edema is characterized by a chronic inflammatory process that affects the superficial layer of the lamina propria of the vocal fold^{1,2}. Currently, its etiology is attributed to smoking associated with vocal abuse. Although it is not a malignant lesion³, its occurrence can substantially affect the quality of the individual's voice^{4,5}.

With Reinke's edema, the number of glottic cycles decreases, reducing the fundamental frequency (F0) and making the voice more serious. The prevalence of Reinke's edema appears to be similar in both sexes. However, the repercussion of voice worsening is more evident in females, which means that the number of women seeking treatment is higher⁵.

According to the literature, the Reinke's Edema causes serious vocal quality for the sex and age, wrinkled, sometimes crackling, with limited modulation, diffuse resonance or laryngo-faringea and loudness reduced. In discreet cases, the voice can present itself fluid, what the socially accepted compensation and the search delays for diagnosis and (or) treatment. In the most advanced cases they can find respiratory complaints and important no pneumoproarticulatory coordination^{5,6}. The acoustic analysis presents F0 exceptionally low, with values of lifted up shimmer and energy of the glottic noise increased. The proportion harmonic noise can be adapted and the most times of phonation can be long, or in the cases of discreet Reinke's Edema, reduced..

Reinke's edema may be isolated or associated with other laryngeal alterations⁷. In a review of ten histological slides of Reinke's edema, normal or hyperplastic epithelium, lamina propria disorganization, basement membrane thickening, vascular dilatation and edema were observed⁸. Generally in the typical pictures there are no celiac atypia in the vocal folds, but epithelial hyperplasia, leukoplast plaques and acanthosis⁵ signs of gastroesophageal reflux⁸ and association with cysts¹⁰ may be found. In a retrospective study of 1093 subjects with non-neoplastic laryngeal lesions, the authors found the presence of Reinke's Edema associated with gastroesophageal⁷ reflux disease in 35%.

At the beginning of the case the vocal quality can be considered pleasant and seductive, but with the passage of time the aggravation of the voice can cause difficulty in the identification of the speaker.

Especially in women, it can generate constraints related to the identification of sex through vocal quality, making them seek treatment⁵. Regarding personality, one study showed that patients with Reinke's Edema have more extrovert personality characteristics compared to patients with carcinoma¹¹.

In a study of 28 smoking chronic men, more than half of them had Reinke's Edema, with a prevalence of type 2. Of these, only 25% had a diagnosis of dysphonia and 21.5% had a vocal complaint¹². In another study, which compared male and female smokers without vocal complaints, divided into male smokers, non-smokers, female smokers and non-smokers, the authors concluded that vocal fold changes were more common in males, with worse vocal quality among smokers, hoarseness was the most frequent vocal alteration¹³.

Recent studies have shown that the abnormalities caused by smoking in Reinke's Edema in women are not fully reversible with surgery and cessation of smoking¹⁴. Concerning the agreement of the vocal and laryngeal analyzes, a study showed that in about half of the cases, only¹⁵. Therefore, it is questioned whether the relationship between worsening of vocal quality, acoustic quality and voice quality of life and the progression of edema are directly proportional, since such evaluations are complementary in clinical practice¹⁶⁻¹⁷ precisely because such relationships are not so direct, and not always the worst vocal quality can be directly related to the most altered laryngeal examination⁵.

In view of the above, the general objective of this work was to relate the data obtained in voice, acoustic and quality of life assessments in voice with the degree of Reinke's Edema in women.

Method

This is an observational, analytical and cross-sectional study, which was approved by the Research Ethics Committee of the institution of origin under number 221.401.

Casuistry

For the study was adopted as inclusion criteria: female gender; with laryngological diagnosis of Reinke's Edema; age greater than 18 years; good general health, not professional voice.

We excluded individuals with a history of laryngeal and / or vocal problems in the past;

who presented associated laryngeal lesions whose observed characteristics overlapped the characteristics of Reinke's Edema; who had health problems that could significantly influence voice quality such as neurological, auditory, hormonal, and (or) head and neck cancer. Individuals who presented with other common health problems were admitted, provided they had no negative influence on laryngological and vocal characteristics. The same occurred for lesions associated with edema: individuals whose other lesions were secondary were included and the vocal characteristics were compatible with those observed in subjects with exclusive Reinke's Edema.

Sample Characterization

Twenty-two women who sought laryngological evaluation at the outpatient clinic of the Hospital where the survey was conducted, from January to May 2012. The general sample had a mean age of 58.3 years (minimum 45 and maximum 78 years), with a mean smoking time of 39.4 years (minimum 22 and maximum 69 years). Regarding the clinical and demographic characterization of the participants, we have: menopause - date of last menstruation equal to or greater than one year (n = 18); (n = 20), presence of air in the voice (n = 2), laryngeal nuisance sensation (n = 11) and very severe voice (n = 19); (n = 3), hypercholesterolemia (n = 4), depression (n = 3), and hypercholesterolemia (n = previous surgery for Reinke's edema (n = 6); Prior speech therapy for Reinke's edema (n = 4); smoking (n = 20); presence of vocal complaint (n = 20); possible laryngeal signs and / or vocal symptoms suggestive of laryngopharyngeal reflux (investigated through a protocol developed by the service itself and applied to all patients, which includes a combination of self-reported data related to symptoms of discomfort, pain and laryngeal discomfort) to hyperemia, edema and interaritenoid pachydermia (n = 11).

According to the classification of Reinke's edema degree 12 to laryngoscopy (degree 1 vocal fold contact is confined to the anterior third of the glottis, degree 2 the vocal fold contact is confined to the anterior two thirds of the glottis and degree 3 the contact is (G1) - subjects with Degree 1 Reinke's Edema (n = 13); the group was divided into two groups: Group 1 (G1); and Group 2 (G2) - subjects with degrees 2 and 3 of Reinke's Edema (n = 9 subjects, 3 with degree 2 and 6 with degree

3). Two cases of mild leukoplakias, two cases of angiomatous polyps, one case of cyst in vestibular fold and one case of epidermoid cyst were diagnosed in association.

Procedures

To perform the research, all subjects were submitted to the following procedures:

Anamnesis: A questionnaire was elaborated by the researchers to obtain the identification data, as well as referring to the habit of smoking and possible vocal complaints / symptoms. In addition, the variables listed in the item "characterization of the sample" were also raised with the purpose of investigating clinical and demographic data that could influence vocal characteristics. However, such variables are not part of the objectives of this study (Annex 1). For the elaboration of the questionnaire, we considered the evidences already taken in the literature on possible vocal complaints / symptoms related to Reinke's Edema, in addition to considering other etiologies of vocal disorders that could be characterized as selection bias of the sample.

Laryngoscopy or Nasofibrolaryngoscopy: through the 8.0 mm - 70° laryngoscope Storz® or the Nasofibrolaryngoscope - Pentax® - FNL-10RP3 (in subjects who did not tolerate oral examination), the following information was collected: Reinke's Edema grade Grade 1, Grade 2 or Grade 3, presence or absence of secondary laryngeal lesion; presence or absence of signs of laryngopharyngeal reflux (RLF). The edema grade was assessed by three physicians, two laryngologists with more than 20 years of age and one resident R3, who analyzed all the samples previously recorded on DVD and indicated by consensus in a specific protocol one of the three possibilities (grade 1, grade 2 or grade 3). Professionals should also report whether there were other lesions / laryngeal changes associated with Reinke's Edema.

- Perceptual-auditory assessment of voice: for this, the analysis material comprised the sustained emission of /ε/ and counting numbers from one to ten. The samples were directly recorded on a notebook with Andrea Pure Audio® brand audio interface and sound card and a Karsect® brand unidirectional head microphone positioned at 45° from the mouth. The recordings were made in a quiet environment, with a noise level of less than 50 dB. The noise was measured by means of the VOXMETRIA acoustic analysis

program, which evaluates the intensity, without the presence of the voice, in an omnidirectional microphone, to capture only the sound of the environment. The samples were referred for evaluation by a speech therapist with an average of seven years of experience in clinical vocal evaluations and who did not participate in any of the data collection stages. The specialist evaluated the general degree of dysphonia in a visual analogue scale (VAS) of 100mm, with 0 indicating normality and 100 indicating extreme deviation. Due to the possibility of differences between sustained emission and speech, the analyzes of these two types of samples were made separately. Internal reliability was performed for both samples, by means of a repetition of approximately 15% of the vocal records. The statistical test of Intraclass Correlation Coefficient (ICC) was used, with a result of 0.76 (sustained emission) and 0.79 (speech), allowing the interpretation of reproducibility as excellent in both evaluations.

- Acoustic voice analysis:
 - Extraction of measures of average fundamental frequency, jitter, shimmer, irregularity ratio GNE and variation in semitones: made by the program Voxmetria® (CTS Informática, version 2.5). The sustained emission of the vowel / ε / was requested. The software used postulated as normality the values of up to 0.6 for jitter, 6.5 for shimmer and 0.5 for GNE ratio.
 - Extraction of temporal measures of the voice: data referring to the MOPs of the vowels “a”, “i” and “u” were collected by means of a digital timer, the subjects remained comfortably seated and each phoneme was produced three times to obtain the average between them.

- Self-evaluation regarding the impact of possible dysphonia: the Voice-of-Life Quality of Life protocol 19-20 was applied. The instrument contains 10 questions concerning the physical, social-emotional and total domains. Responses are provided using a one to five point Likert scale, where the individual should measure how much difficulty is relevant. The protocol has a specific formula for calculating the scores, which can vary from zero to 100 for each of the three domains, and the closer to 100, the better the voice quality of the individual.

All data regarding the research were tabulated and analyzed statistically. The non-parametric Mann-Whitney test was used to compare the two groups (G1 and G2) with all quantitative / continuous variables (EAV values, acoustic analysis values and values obtained in the QOL). The same test was used to compare the values obtained in the VAS according to the interfering variables presented by the participant. A significance level of 0.05 was adopted.

Results

The results of the study showed that there were no differences in vocal characteristics according to the variables: presence of comorbidities, history of previous surgeries, signs of laryngopharyngeal reflux at the laryngoscopy examination, associated laryngeal lesions and previous speech therapy. Therefore, it was decided not to exclude them due to the large number of information in the literature as to how much of them are common and associated with cases of Reinke's Edema. There was a difference in the chained speech, and the women who had been through the menopausal period presented mean values of deviation of the highest vocal quality. For the other variables, there were no differences (Table 1).

Table 1. Distribution of the results according to the presence of interfering variables and the vocal quality of the perceptual-auditory analysis (n = 22)

Variables	VAS Values	Sustainable emission		Linked Speech	
		No	Yes	No	Yes
Menopause	Average	56.8	66.7	31.8	52.8
	Median	54	63	30	45.5
	Standard deviation	8.5	15.8	7.4	19.3
	P	0.268		0.021*	
Comorbidities	Average	59.8	66	35.5	51.9
	Median	61.5	62.5	38	45
	Standard deviation	5.3	16.4	11.3	19.8
	P	0.733		0.187	
Previous Surgery	Average	67.6	57.7	49.1	48.7
	Median	63	58	45	43.5
	Standard Deviation	16.1	9.4	21.2	15.5
	P	0.252		0.912	
Signs of laryngopharyngeal reflux with laryngoscopy	Average	63.4	65.5	47.4	49.7
	Median	51	64	40	44
	Standard deviation	20.9	12.3	26.3	16.3
	P	0.306		0.438	
Associated lesions	Average	65.9	62.7	48.1	50.7
	Median	64	61	43	45
	Standard deviation	16.6	12	18.6	22.5
	P	0.698		0.647	
Previous Speech therapy	Average	66.7	56.8	51.7	36.5
	Median	63	56	45	36.5
	Standard deviation	15.9	7.4	20.2	8.7
	P	0.286		0.173	

Mann Whitney Test - $p < 0,05$
VAS - Visual Analog Scale

The distribution of the interfering variables was done according to Reinke's Edema grading group (Group 1 - grade 1 and Group 2 - grades 2 and 3), in addition to the grade attributed to voice. There was no difference between the groups regard-

ing age, number of cigarettes consumed per day, smoking time, complaint time and note attributed to voice. The groups differed only in relation to the average number of symptoms presented between them (Table 2).

Table 2. Distribution of results according to anamnesis and grouping of degrees of Reinke's Edema.

Interfering Variables		Standard deviation	N	IC	P-value	
Age	Group 1	58.15	10.36	13	5.63	0.920
	Group 2	58.56	9.84	9	6.43	
Number of cigarretes/day	Group 1	14.15	13.28	13	7.22	0.634
	Group 2	10.00	6.75	9	4.41	
Time of smoking	Group 1	38.08	12.48	13	6.78	0.365
	Group 2	41.22	10.62	9	6.94	
Time of complaint	Group 1	5.00	3.25	12*	1.84	0.085
	Group 2	8.00	4.04	8*	2.80	
Amount of symptoms	Group 1	3.00	1.15	13	0.63	0.001
	Group 2	5.33	1.32	9	0.86	
Note assigned to voice	Group 1	4.62	3.64	13	1.98	0.083
	Group 2	2.00	2.12	9	1.39	

Mann-Whitney Test. Group 1: Reinke's Edema degree 1; Group 2: Reinke's Edema degree 2 and 3. IC=Confidence interval.

*In the item time of complaint, two women had no complaint, being one of G1 and one of G2, and were taking the exam because they had been referred.

The results also showed the values of the degree of the vocal deviation of the sustained emission and the linked speech, evaluated by visual analogue scale, according to the grouping of the degrees of Edema of Reinke. It was observed that

Group 2 (edemas grade 2 and 3) had worse results in relation to Group 1 (grade 1 edema) as to the degree of vocal deviation in both sustained and connected speech (Table 3).

Table 3. Distribution of results according to degree of vocal deviation and grouping of degrees of Reinke's Edema

Variable		VAS Average	Standard deviation	N	IC	P-value
Degree of sustained vocal emission (VAS)	Group 1	56.15	6.26	13	3.40	0.002
	Group 2	77.44	15.33	9	10.02	
Degree of voice alteration speech chained (VAS)	Group 1	37.77	9.47	13	5.15	0.004
	Group 2	65.11	18.91	9	12.35	

Mann-Whitney Test. Group 1: Reinke's Edema Degree 1; Group 2Reinke's Edema Degree 2 e 3
VAS – Visual Analog Scale

The mean values of the acoustic analysis were obtained according to Reinke's Edema grading (Table 4). There were differences between the groups

in the parameters jitter, shimmer, irregularity and proportion GNE, with worse results for Group 2.

Table 4. Distribution of results according to acoustic analysis values and grouping of degrees of Reinke's Edema

Acoustic Analysis			Standard deviation	N	IC	P-value
TMF	Group 1	10.55	3.32	13	1.81	0.116
	Group 2	8.23	2.60	9	1.70	
F0	Group 1	148.52	17.99	13	9.78	0.133
	Group 2	137.47	14.45	9	9.44	
Jitter	Group 1	0.35	0.22	13	0.12	0.001
	Group 2	1.35	1.16	9	0.76	
Shimmer	Group 1	4.08	1.33	13	0.72	0.042
	Group 2	9.71	10.09	9	6.59	
Irregularity	Group 1	3.89	0.59	13	0.32	0.001
	Group 2	5.53	1.14	9	0.74	
GNE ratio	Group 1	0.82	0.13	13	0.07	0.001
	Group 2	53.10	4.00	9	2.61	
Variation in semitones	Group 1	12.00	5.48	13	2.98	0.893
	Group 2	12.56	5.98	9	3.91	

Mann-Whitney Test. Group 1: Reinke's Edema Degree 1; Group 2: Reinke's Edema Degree 2 and 3

Regarding the QVV results, there were differences between groups in all domains (physical, emotional and total), with worse results obtained by Group 2 in all domains. There was a difference

in the amount of symptoms that was higher in G2 women. The mean value obtained by the G1 women was three symptoms and G2 was 5.5 symptoms. (Table 5).

Table 5. Distribution of results according to the QOL and the grouping of degrees of Reinke's Edema

Quality of life in voice			Standard deviation	N	IC	P-value
Functional Domain	Group 1	77.42	25.00	13	13.59	0.011
	Group 2	47.67	18.66	9	12.19	
Socioemotional Domain	Group 1	78.70	24.31	13	13.22	0.019
	Group 2	50.70	31.31	9	20.46	
Total domain	Group 1	78.08	22.89	13	12.44	0.012
	Group 2	49.44	20.03	9	13.09	

Mann-Whitney Test. Group 1: Reinke's Edema Degree 1; Group2: Reinke's Edema Degree 2 and 3

Discussion

The understanding of the relationship between vocal, acoustic and quality of life voice evaluations of women with different degrees of Reinke's edema makes possible more assertive strategies in vocal therapy, taking into account the women's perception of vocal changes due to evolution of such

injury. The objective of this work was to deepen the discussion about these relationships by crossing different variables related to four main spheres of evaluation: laryngological, perceptive-auditory, acoustic and self-evaluation.

The only interfering variable whose statistically significant difference was confirmed was "postmenopause", women who mentioned that the date of the last menstrual period had occurred

more than a year had higher values in VAS during the auditory-perceptual evaluation speak spontaneously). According to the study that categorized Visual Analogue Scale values in Numerical Scale¹⁹, women with Reinke Edema who were not in the menopause presented general grade of normal vocal quality, whereas women who were in the menopause presented general degree of moderate vocal quality.

In studies related to Reinke's edema, the authors reported that worsening of the disease is more common in women and postmenopausal because of its association with vocal changes due to the aging process (anatomical and hormonal)^{1,2}. The data from the present study corroborate this previous study and, therefore, it was decided to analyze the vocal characteristics even in the presence of the interfering variable (menopause), since it represents the most common situation in the evaluation of women with Reinke's Edema.

A recent study has shown that there is a positive association between laryngopharyngeal reflux and Reinke's Edema in up to 90% of cases⁹. The results of the present study showed, however, that both the association with reflux and other variables with possibility of interference were not significant for the modification of the perceptual-auditory parameters of the voice, as presented in Table 1.

Regarding the association between the degree of Reinke's edema and the interfering variables present in the anamnesis, there was no difference in age, number of cigarettes per day, smoking time and complaint time. It is noteworthy that even without such differences, all women sought treatment, which indicates that the change was sufficiently important to make them go through laryngological evaluation. It is possible that the results mentioned above are related to the multifactorial involved in the development of Reinke's Edema. Vocal abuse, for example, is often associated with tobacco when discussing the etiology of this disease^{1,2,4}.

It was also observed that the age, number of cigarettes consumed per day and time of smoking were not related to the degree of Reinke's edema, that is, there are probably other individual issues that influence the progress of the injury.

Thus, it is believed that variables such as number of cigarettes consumed per day and mean time of smoking may have been superimposed by other aspects related mainly to the use of voice itself, and that make a difference regarding the vocal

characteristics presented by the patient. These data corroborate previous research results with Reinke's Edema, which also found no relationship between vocal characteristics and variables regarding the number of cigarettes consumed per day and smoking time in years²¹.

It has been found that as the degree of edema progresses, so does the number of vocal symptoms in women. This characteristic does not seem to occur in the same way in men, since they have fewer complaints regarding the voice, probably justified by the mass effect that can trigger a more severe pitch and mask the vocal symptoms¹⁴. Recent research also concluded that the degree of edema influences the perception of lay judges regarding the sex of women with Reinke's Edema, and the higher the lesion, the greater the chance that women will be confused with men by voice²¹.

In a previous study, a group of women with Reinke's Edema should perform self-assessment of their voices through a scale of masculinity and femininity, using scores ranging from 0 (all-male) to 9 (fully female). The mean value obtained by the research group was 3.6 (SD = 1.9), while the control group of vocally healthy women obtained a mean of 6.9 (SD = 1.8). The authors concluded that women with Reinke's edema themselves self-evaluate their voices as masculine²².

It is believed that in the case of Reinke's Edema in women, even fewer symptoms may already be enough for them to seek evaluation. G1 women searched for the service with an average of three symptoms. This can be attributed to the particularities involved in the vocal characteristics resulting from Reinke's edema. The "very thick voice" symptom, for example, can have a very negative influence on vocal psychodynamics and interpersonal relationships. Thus, it is possible that, more than the mean number of symptoms, the type of symptom made a difference at the moment of the decision for the search for specialized care. A higher number of women with grade 1 of Reinke's Edema compared to the other grades were also observed in a recent study that retrospectively analyzed 60 patients treated at a specialized service over a four-year period²³.

It was also observed a difference in the mean of the note attributed to the voice (0 being very bad voice and 10 indicative of excellent voice), both groups assigned very low notes to the voice, but for G2 this note showed dissatisfaction even bigger.

Concerning the relation between the groups and the objective data of the perceptual-auditory evaluation, corresponding to the overall degree of dysphonia in analogue-visual scale for the samples of sustained and connected emission, there was a statistically significant difference, and the G2 women presented major alterations when compared to G1. The mean scores obtained by G2 subjects were compatible with moderate dysphonia, whereas G1 corresponded to mild to moderate alterations^{24,25}.

These results demonstrate that increased edema causes the roughness to become more evident, the pitch more severe and, consequently, the overall degree of dysphonia, greater.

There were no statistically significant differences between the groups, both of which presented lower mean values than the literature postulated as normal for individuals without voice complaints (14 seconds for women)⁵. Although authors' report that patients with Reinke's Edema, especially in more advanced degrees, may have long TMF, since the very presence of edema controls the air outlet⁵ the results of the present study indicated reduced values. These data corroborate the previous work that mentions that patients with organofunctional dysphonias, including Reinke's Edema, may present reduced TMF²⁶. It is believed that this finding may be related to a possible pulmonary / respiratory compromise in these women, who were smokers for many years and who probably already presented changes related to vital capacity.

In this study, F0, although with a lower mean value in G2, did not show a statistically significant difference. It was observed that even the subjects in Group 1 had an average F0 value below that expected for women (150 to 250 Hz for women)⁵. The mean obtained by previous research in patients with Reinke's Edema was even lower, around 108 Hz for women²⁷.

Regarding the measures of jitter, shimmer, irregularity and proportion GNE, there were differences between the groups in all of them, and with the advancement of the degree of edema, greater were the changes in these questions. According to the normal values provided by the manufacturer of the program used, only the G2 subjects presented altered values for jitter and shimmer. The literature indicates that, in patients with Reinke's Edema, it is common to have very high shimmer values, due to vocal fold vibration slowing and spectrum devia-

tion due to hoarseness⁵ which in the present study was only observed in the most advanced edema.

Paralleling the perceptual-auditory and acoustic analyzes performed in this study, there were differences between the groups, that is, greater auditory and acoustic alterations as the edema evolved. This fact is interesting, since the reliability and the association between the values of the acoustic analysis to the other forms of vocal evaluation (laryngeal and perceptive-auditory) are still questionable²⁸.

Regarding the association between laryngological data and vocal self-assessment, through the application of the QVV protocol^{19,20}, there was an increase in the impact of dysphonia on quality of life with the evolution of edema in all domains analyzed by the instrument (physical, social-emotional and total). G1 women had total mean QOL scores consistent with values obtained in most behavioral dysphonics^{25,26}. G2 women, on the other hand, had lower mean total scores, including in the social-emotional domain, compatible with organic dysphonia^{29,30}.

It is considered that this discrepancy is related to vocal psychodynamics, in addition to the organic issues that edema entails, since one of the main complaints of women with Reinke's edema to the highest degree is that they are confused with people of the opposite sex on telephone, and not recognize the current voice as compatible with their personality and the message they wish to convey. These restrictions cause these women to self-evoke their voices in a very negative way and obtain far lower QOL scores than those expected for individuals with no voice complaints, who, in general, present averages around 90/95 points^{20,29}.

It is important to mention that the sample of this study was composed by women who were in otorhinolaryngological follow-up and who, therefore, sought medical and speech-language evaluation due to voice or health complaints. Thus, the results obtained in this study may not represent the complaints, symptoms and vocal characteristics of the population with the same lesion and who did not seek help. Therefore, the demand for specialized care seems to be an indicator that such women have a clearer perception about the changes in their voices due to smoking and, consequently, to Reinke's Edema.

We suggest that further research may do other analyzes, such as comparing individuals adhering

rather than to treatment and vocal changes observed after treatment, as well as with a greater number of subjects and comparisons of vocal characteristics in the three degrees of Reinke's Edema, separately.

Final considerations

The laryngological characteristics of Reinke's edema progression are directly related to worsening of perceptual-auditory and acoustic parameters of the voice and to a greater negative impact of dysphonia on the quality of women's life.

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ATTACHMENT 1: Data collection questionnaire		
Name:		
Age:		
Number of cigarretes/day		
Time of smoking (in years):		
Vocal complaint time (in years):		
Points assigned to voice (0 very bad and 10 excellent)		
VOCAL COMPLAINT	YES	NO
VOCAL SYMPTOMS		
Hoarse	YES	NO
Presence of air in the voice	YES	NO
Sensation of laryngeal discomfort	YES	NO
Presence o fair in the voice	YES	NO
Deep voice/ thick voice	YES	NO
Tiredness/ respiratory difficult while speaking	YES	NO
Periods of aphonia (total voice loss)	YES	NO
HEALTH DATA		
Have you had menopause?	YES	NO
Previous surgery of Reinke's Edema	YES	NO
Previous speech therapy for Reinke's Edema	YES	NO
Arterial hypertension?	YES	NO
Diabetes?	YES	NO
Hypercholesterotmy?	YES	NO
Cardiopathy?	YES	NO
Currently smoke?	YES	NO
Pnemopathy?	YES	NO