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Self-perception of vocal fatigue in the late postoperative period of individuals undergoing thyroidectomy

Autopercepção de fadiga vocal no pós-operatório tardio de indivíduos submetidos à tireoidectomia

Autopercepción de fatiga vocal en el postoperatorio tardío de individuos sometidos a tiroidectomía

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Abstract

Introduction: thyroidectomy is widely used to treat thyroid diseases and may cause persistent vocal alterations, such as vocal fatigue, which negatively impact quality of life. **Objective**: to identify the self-perception of vocal fatigue in individuals in the late postoperative period of thyroidectomy and compare findings to sociodemographic and clinical data. **Method**: observational, cross-sectional, analytical study conducted in a university hospital with a convenience sample. Included were patients ≥18 years, with ≥1 year since thyroidectomy, without a history of laryngeal surgery or other associated neoplasms. Data on sex, age, self-reported skin color, time since surgery, type of nodule, treatment (surgery alone or combined with radioiodine therapy/radiotherapy), speech therapy history, and vocal complaints were collected. The Vocal Fatigue Index (VFI) was applied, and Mann-Whitney and Kruskal-Wallis tests were used ($p<0.05$). **Results**: twenty-nine individuals participated, mean age of 54,8 years, mostly female (86.3%), and self-reported as mixed-race (62.1%). Postoperative time ranged from 1 to 10 years,

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with malignant nodules predominating (68.9%). Most had not undergone speech therapy (79.3%) and reported vocal complaints (75.8%). Mean VFI scores for factors 1, 2, and 3 were 6.89, 3.06, and 2.37, with factors 1 and 3 above the cutoff. Factor 4 averaged 6.34, suggesting limited recovery with rest. The total VFI score was high in 82.7% of participants, with no significant difference with sociodemographic or clinical variables. **Conclusion**: Individuals in the late postoperative period of thyroidectomy perceive persistent vocal fatigue, regardless of sex, time since surgery, type of nodule, or treatment performed.

Keywords: Voice; Thyroidectomy; Voice Disorders; Fatigue; Thyroid Neoplasms.

Resumo

Introdução: a tireoidectomia é amplamente utilizada no tratamento de doenças tireoidianas, podendo causar alterações vocais persistentes, como a fadiga vocal, que impactam negativamente a qualidade de vida. **Objetivo**: identificar a autopercepção de fadiga vocal em indivíduos no pós-operatório tardio de tireoidectomia e compará-la com os achados e aos dados sociodemográficos (sexo, tempo de cirurgia, tipo de nódulo e tratamento realizado). **Método**: estudo observacional, transversal e analítico, realizado em hospital universitário com amostra por conveniência. Foram incluídos pacientes ≥18 anos, com ≥1 ano de pós-operatório de tireoidectomia, sem histórico de cirurgias laríngeas ou outras neoplasias associadas. Foram coletados dados de sexo, idade, cor autodeclarada, tempo de cirurgia, tipo de nódulo, tipo de tratamento (cirurgia isolada ou associada à iodoterapia/radioterapia), realização de fonoterapia e queixas vocais. Aplicou-se o Índice de Fadiga Vocal (IFV) e utilizaram-se os testes de Mann-Whitney e Kruskal-Wallis, com $p < 0,05$. **Resultados**: participaram 29 indivíduos, com média de idade de 54,8 anos, maioria do sexo feminino (86,3%) e autodeclarados pardos (62,1%). O tempo de pós-operatório variou entre 1 e 10 anos, predominando os diagnósticos de nódulo maligno (68,9%). Entre os participantes, 79,3% não faziam fonoterapia e 75,8% relataram queixas vocais. As médias dos fatores 1, 2 e 3 do IFV foram 6,89; 3,06; e 2,37, com os fatores 1 e 3 acima da nota de corte. O fator 4 teve média de 6,34, sugerindo pouca recuperação com repouso. O escore total do IFV foi elevado em 82,7% dos participantes. Não houve diferença significativa entre o escore e variáveis sociodemográficas ou clínicas. **Conclusão**: indivíduos submetidos à tireoidectomia no pós-operatório tardio percebem fadiga vocal persistente, independentemente de sexo, tempo de cirurgia, tipo de nódulo ou tratamento realizado.

Palavras-chave: Voz; Tireoidectomia; Distúrbios da voz; Fadiga; Neoplasias da Glândula Tireoide.

Resumen

Introducción: la tiroidectomía se utiliza ampliamente para tratar enfermedades tiroideas y puede provocar alteraciones vocales persistentes, como la fatiga vocal, que afectan negativamente la calidad de vida. **Objetivo**: identificar la autopercepción de fatiga vocal en individuos en el posoperatorio tardío de tiroidectomía y comparar los hallazgos con datos sociodemográficos y clínicos. **Método**: estudio observacional, transversal y analítico realizado en un hospital universitario con muestra por conveniencia. Se incluyeron pacientes ≥18 años, con ≥1 año desde la tiroidectomía, sin antecedentes de cirugía laríngea u otras neoplasias asociadas. Se recopilaron datos de sexo, edad, color de piel autodeclarado, tiempo desde la cirugía, tipo de nódulo, tratamiento (cirugía sola o combinada con yodoterapia/radioterapia), historial de fonoaudiología y quejas vocales. Se aplicó el Índice de Fatiga Vocal (IFV) y se utilizaron las pruebas de Mann-Whitney y Kruskal-Wallis ($p<0,05$). **Resultados**: participaron 29 individuos, edad media 54,8 años, en su mayoría mujeres (86,3%) y autodeclarados mestizos (62,1%). El tiempo posoperatorio varió de 1 a 10 años, con predominio de nódulos malignos (68,9%). La mayoría no había realizado fonoaudiología (79,3%) y reportó quejas vocales (75,8%). Las medias de los factores 1, 2 y 3 del IFV fueron 6,89; 3,06; y 2,37, con los factores 1 y 3 por encima del punto de corte. El factor 4 promedió 6,34, sugiriendo escasa recuperación con reposo. El puntaje total del IFV fue alto en el 82,7% de los participantes, sin diferencia significativa con variables sociodemográficas o clínicas. **Conclusión**: los individuos en el posoperatorio tardío de tiroidectomía perciben fatiga vocal persistente, independientemente del sexo, tiempo desde la cirugía, tipo de nódulo o tratamiento realizado.

Palabras clave: Voz; Tiroidectomía; Trastornos de la Voz; Fatiga; Neoplasias de la Tiroides.

Introduction

The thyroid gland, one of the largest in the human body, is responsible for producing the hormones that regulate metabolism. It is a unique bilobed structure, with two lateral lobes joined inferiorly by a flattened isthmus, giving it an H-like shape. Alterations in its constitution can generate dysfunctions noticeable throughout the organism[1].

Thyroid diseases are frequent and include hypothyroidism, hyperthyroidism, goiter, and thyroid cancer[1]. In Brazil, it is estimated that about 10% of the population has some alteration in thyroid function, with higher prevalence among women and the elderly[2]. Regarding cancer, projections for the 2023–2025 triennium indicate approximately 704,000 new cancer cases in the country[3].

Thyroidectomy, the partial or total surgical removal of the thyroid gland, is a widely used treatment for benign and malignant conditions. The technique is considered safe and effective, presenting low rates of permanent complications, such as hypoparathyroidism and recurrent laryngeal nerve (RLN) injury[4]. These surgical advances have consolidated thyroidectomy as one of the main management strategies for thyroid diseases.

However, even without evident RLN lesions, vocal fold paralysis or paresis may occur[5]. The prevalence of postoperative vocal alterations varies from 16% to 36%[5], reaching up to 69.2% in the immediate postoperative period[6], , with dysphonia being one of the most frequent sequelae after thyroidectomy. The most common symptoms include reduced vocal pitch, hoarseness, weakness of vocal projection, sensation of a lump in the throat, dry throat, throat clearing, and vocal fatigue[6]. Although often transient, these symptoms may persist in up to 50% of patients, significantly impacting quality of life[7].

Nevertheless, its diagnosis requires specialized instrumental examinations, which are not always available in routine care within public or high-demand services[5]. The difficulty in early recognition of these vocal alterations is partly due to the lack of systematic application of validated protocols in the pre- and postoperative periods[8].

Vocal fatigue, a concept widely discussed in the literature, refers to a self-reported negative vocal adaptation resulting from prolonged voice use[9,10]. It is characterized by increased phonatory effort, laryngeal discomfort, tension in the neck and shoulders, pain, and loss of vocal flexibility, symptoms that tend to improve with rest[10,11]. Assessing vocal fatigue is challenging, given its multifactorial nature and the scarcity of specific instruments[11]. In this context, the use of self-reported instruments, such as the Vocal Fatigue Index (VFI), is presented as a practical alternative for patient screening, allowing the early identification of vocal symptoms related to fatigue and guiding the need for specialized evaluation[5,10].

Given the above, the present study aimed to identify, in the late postoperative period, the self-perception of vocal fatigue in patients undergoing thyroidectomy and to compare these findings with sociodemographic data.

Material and method

This is an observational, cross-sectional, and analytical study, approved by the Research Ethics Committee (REC) under opinion no. 5.362.566. Using convenience sampling, patients aged 18 years or older who had undergone thyroidectomy due to the presence of a thyroid nodule of any nature, attended at the Head and Neck Surgery outpatient clinic of a university hospital, in the late postoperative period, one year or more after surgery, were included. Patients who self-reported any neurological impairment or another associated oncological comorbidity beyond thyroid gland cancer were excluded, due to possible interferences in the process.

Participants were personally approached during routine outpatient visits, and those who agreed to participate in the study signed the Informed Consent Form (ICF). Initially, the objectives and procedures of the study were explained, followed by the application of a structured questionnaire in a private environment, ensuring privacy and minimizing external interferences. After providing consent, participants answered a self-reported sociodemographic questionnaire containing the following questions: name, self-declared race/color, age, sex, date of surgery, history of speech therapy, time since diagnosis, type of nodule, speech therapy complaints, and type of treatment (whether only surgical or if complementary methods such as radioiodine therapy and/or radiotherapy were used). These variables were collected to characterize the sociodemographic and clinical profile of the

sample, allowing analysis of potential influencing factors on the outcomes.

Next, participants answered the VFI, which is a Patient Reported Outcome Measures (PROM) consisting of 17 items, scored according to the frequency of symptoms as follows: "never" (zero), "almost never" (one point), "sometimes" (two points), "almost always" (three points), and "always" (four points). Its scoring is determined using a specific formula, as suggested in its validation process for Brazilian Portuguese[12], and establishes a cutoff value for the total score of 11.5 points. In addition, each factor has its own corresponding cutoff value: "Vocal Fatigue and Limitation" (Factor 1) of 4.5 points; "Vocal Restriction" (Factor 2) of 3.5 points; "Physical Discomfort Associated with Voice" (Factor 3) of 1.5 points; and "Recovery with Vocal Rest" (Factor 4) of 8.5 points[12]. While in the other factors higher scores indicate a greater presence of symptoms related to vocal fatigue, in Factor 4 higher scores reflect the adoption of adaptive strategies, which may indicate a lower perception of fatigue. For this reason, data analysis of this factor requires a reverse interpretation.

The data were tabulated in Microsoft Office Excel® and analyzed qualitatively and statistically. For the comparison between sociodemographic data (sex, time since surgery, type of nodule, and treatment performed) and the VFI results, the Mann-Whitney and Kruskal-Wallis tests were applied, as it is a nonparametric sample. Statistical analysis was performed using Jamovi, version 2.5.4. The significance level adopted was 5% ($p<0.05$).

Results

A total of 29 individuals diagnosed with thyroid nodules and who had undergone thyroidectomy participated in the study. Of these, 24 were female (82.7%), with a mean age of 54.8 years (SD±15.5), and the most frequently self-declared race/color was brown (62.1%; n=18). Most individuals reported vocal complaints (75.8%; n=22), and 79.3% (n=23) had never undergone speech therapy. According to the anatomopathological data, the most prevalent type of nodule was malignant (68.9%, n=20) (Table 1).

Table 1. Sociodemographic and socio-clinical data of the sample (n=29).

	Sociodemographic variables	n (%)
Sex	Male Female	4 (13.7%) 25 (86.3%)
Type of Nodule	Benign Malignant	9 (31.1%) 20 (68.9%)
Has already undergone Speech-Language Therapy	Yes No	6 (20.6%) 23 (79.3%)
Race/Color	White Parda Black	9 (31.1%) 18 (62.1%) 2 (6.8%)
Treatment	S S + AT	13 (44.8%) 16 (55.2%)
Vocal complaint	Absent Present	7 (24.2%) 22 (75.8%)
Time since diagnosis	1 - 5 years 6 - 10 years Over 10 years	10 (34.4%) 10 (34.4%) 9 (31.1%)
Date of surgery	1 - 5 years 6 - 10 years Over 10 years	14 (48.2%) 11 (37.9%) 4 (13.8%)

Caption: S = Surgery; S+AT = Surgery and adjuvant treatment.

Factors 1 and 3 and the total VFI score presented means above the cutoff value. Factor 4, considered positive, presented a mean below the cutoff value, demonstrating no recovery from fatigue even with vocal rest (Table 2).

Table 2. Scores found in the Vocal Fatigue Index (VFI) (n=29).

	Factor 1	Factor 2	Factor 3	Factor 4	Total VFI
Mean (±SD)	6.90 (±8.17)	3.07 (±3.60)	2.38 (±3.77)	6.34 (±5.45)	18 (±10.61)
Median	2	2	0	8	14
Minimum - maximum	0 - 27	0 -12	0-11	0-12	0 - 49

Caption: Factor 1 = Vocal fatigue and limitation; Factor 2 = Vocal restriction; Factor 3 = Physical discomfort associated with the voice; Factor 4 = Recovery with vocal rest; VFI = Vocal Fatigue Index; SD = standard deviation.

There was no statistically significant difference regarding the VFI scores and the sociodemographic data (Table 3).

Table 3. Comparison between factor scores and total VFI score with sociodemographic data (n=29).

	Date of Surgery*	Sex**	Treatment**	Type of nodule**
Factor 1	0.578	0.405	0.241	0.752
Factor 2	0.704	0.741	0.274	0.078
Factor 3	0.237	0.517	0.290	0.653
Factor 4	0.608	0.927	0.377	0.940
Total VFI	0.656	0.599	0.824	0.567

Caption: * = Kruskal-Wallis, ** = Mann-Whitney, p-value: ≤0.05 is statistically significant, VFI = Vocal Fatigue Index, Factor 1 = Vocal fatigue and limitation; Factor 2 = Vocal restriction; Factor 3 = Physical discomfort associated with the voice; Factor 4 = Recovery with vocal rest.

Discussion

In this study, most participants who underwent thyroidectomy were female, with a mean age of 54.8 years. These data are consistent with the literature, which points to a higher incidence of thyroid diseases and thyroid cancer in women, possibly due to the action of estrogen on follicular cells of the gland[2,13]. The mean age observed aligns with recent studies that report a prevalence of thyroid alterations between 50 and 60 years[14]. Although some studies indicate a higher concentration of the disease in elderly individuals, the data from this study suggest detection and treatment in younger age groups, possibly reflecting improvements in diagnostic methods and greater access to imaging exams or the profile of the service users.

The most prevalent self-declared race/color in the sample was brown, which may also reflect the population profile treated in the public service where the research was conducted. National studies indicate that self-declared brown and black individuals sometimes present greater vulnerability in access to healthcare and delayed diagnosis, although this datum may also indicate Brazil's ethnic-racial diversity[15].

Regarding the nature of the nodules, the diagnosis of malignancy predominated, which is also corroborated by the literature[16]. Although malignant thyroid nodules correspond to a small proportion of the total detected nodules (between 7% and 15%)[17], surgical indication is primarily directed toward these cases, justifying their predominance in populations undergoing thyroidectomy. Thus, the

expected profile of patients in follow-up within the hospital surgical context is reinforced.

Most individuals reported not having undergone speech therapy. The low adherence may be related to a lack of awareness of the benefits of vocal rehabilitation, difficulties accessing specialized services, or undervaluing vocal complaints during postoperative follow-up[18]. This absence of intervention may contribute to the persistence or worsening of the vocal fatigue symptoms observed. However, it is important to highlight that the vocal fatigue reported by participants cannot be attributed exclusively to the absence of speech therapy or surgery itself. Specific biological and physiological mechanisms, such as neuromuscular inefficiency and deficits in cardiovascular recovery, also contribute to the condition[19]. Understanding these mechanisms may favor therapeutic approaches more targeted to the etiology rather than based solely on symptoms[20].

Concerning the time since diagnosis and date of surgery, the data show a relatively balanced distribution among the intervals of 1 to 5, 6 to 10, and more than 10 years. This temporal heterogeneity suggests different stages of follow-up and may influence both the perception of vocal symptoms and functional adaptation over time[21]. Patients with older diagnoses or surgeries may have developed compensatory strategies or, on the contrary, may maintain untreated chronic symptoms[22].

The high prevalence of vocal complaints found even in the late postoperative period is consistent with other studies, which indicate that up to 50% of patients may present persistent vocal alterations after thyroidectomy[5,23]. Although many vocal symptoms are transient and expected in the first months after surgery[24], the persistence of long-term vocal complaints, such as hoarseness, pitch alteration, and the sensation of vocal fatigue, reveals the complexity of functional sequelae even in technically successful surgeries.

The complaints corroborate the VFI data, in which the sample exceeded the cutoff scores for the factors of vocal limitation and physical discomfort associated with voice, with means above the cutoff points. In addition, the recovery with vocal rest factor did not reach the expected value, indicating that vocal rest apparently is not sufficient to reverse the sensation of fatigue. Thus, it is suggested that the presence of phonatory disorders is not exclusively attributable to evident anatomical lesions but may reflect muscular, neuromuscular, or compensatory alterations resulting from postsurgical vocal adaptation[5,7].

The specific literature on thyroidectomy indicates that vocal fatigue may result both from direct alterations in the recurrent laryngeal nerve and from secondary adaptations to the surgical procedure, such as edema, fibrosis, or modifications in laryngeal tension[6,7]. Furthermore, even in surgeries without apparent complications, subtle laryngeal alterations may compromise phonation efficiency and lead to increased vocal effort[21].

Vocal fatigue is recognized as one of the main limiting factors for dysphonic individuals[12]. Characterized by a sensation of effort, laryngeal discomfort, pain, and loss of vocal flexibility, fatigue directly impacts individuals' quality of life, interfering with social activities, professional performance, and self-esteem[9,10,25,26]. Studies demonstrate that individuals with vocal fatigue present worse voice-related quality of life, greater limitations in communicative activities, and a higher risk of developing emotional alterations such as anxiety and depression[25,27].

In individuals who underwent thyroidectomy, the presence of persistent vocal fatigue suggests a need not only for monitoring the anatomical integrity of laryngeal structures but also for speech therapy follow-up focused on functional rehabilitation and adaptation to new vocal demands. Therefore, the findings of this study reinforce the importance of prevention and vocal rehabilitation strategies in the postoperative period, including the late phase, with the implementation of validated protocols for the evaluation and monitoring of vocal symptoms.

The absence of a statistical difference between VFI scores and variables such as sex, type of treatment, and type of nodule suggests that the perception of vocal fatigue may depend on multiple individual factors, including anatomical, physiological, and psychosocial aspects. This result is consistent with studies indicating that vocal sensitivity and pre-existing vocal behavior, in addition to voice use patterns, strongly influence the experience of fatigue, regardless of objective clinical factors[21].

Among the limitations of this study, the absence of data on the extent of thyroidectomy (total or partial) stands out, a factor that may directly influence the magnitude of vocal alterations[27]. The absence of information regarding participants' professional occupation prevented the analysis of the

specific impact on voice professionals, a population potentially more susceptible to vocal fatigue. Moreover, although the Unified Health System (SUS) provides follow-up, limited adherence to treatment continuity and follow-up, and speech-language therapy rehabilitation consultations may have influenced both the perception of symptoms and the pattern of vocal recovery in patients. Another relevant limitation is the heterogeneity of the sample, both regarding age and postoperative follow-up time and history of speech therapy, which may have introduced biases and hindered the identification of direct causal relationships between thyroidectomy and vocal fatigue.

Despite the limitations presented, this study contributes to a better understanding of the persistence of vocal fatigue in individuals undergoing thyroidectomy, highlighting the importance of continuous multiprofessional monitoring. Furthermore, it reinforces the need for specific strategies for health promotion, prevention, evaluation, and vocal intervention, aimed at preventing and managing communicative alterations, to promote improved quality of life and functional well-being of these patients over time..

Conclusion

Individuals who underwent thyroidectomy, in the late postoperative period, perceive "Vocal Fatigue and Limitation" and "Physical Discomfort Associated with Voice," without recovery from fatigue with vocal rest, regardless of sex, time since surgery, type of nodule, and type of treatment.

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