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Functional laryngectomy, quality of life, and speech-language pathology challenges: a clinical case study

Laringectomia funcional, qualidade de vida e desafios fonoaudiológicos: estudo de caso clínico

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ABSTRACT
Implications for the patient's quality of life have become crucial in recent treatment decisions. This single case study compared the pre- and post-total laryngectomy periods, focusing on quality of life and functional aspects. Assessment instruments such as the Vocal Handicap Index, M.D. Anderson Quality of Life Questionnaire, University of Washington, and World Health Organization Disability Assessment Schedule were used, as well as speech samples and videofluoroscopy swallowing exams The findings indicate that laryngotracheal separation was beneficial following head and neck cancer treatment, facilitating oral intake and aiming to restore the pleasure of eating and alaryngeal communication. It can be concluded that the improvement in quality of life was evident, and the permanent stoma did not negatively impact the patient's life.

Keywords: Laryngeal cancer. Swallowing. Total laryngectomy. Quality of life. Voice.

RESUMO
Recentemente, implicações na qualidade de vida do paciente têm sido importantes na escolha do tratamento. Foi realizado um estudo de caso único com o objetivo de comparar o momento pré e pós laringectomia total, com ênfase na qualidade de vida e aspectos funcionais. Dele foram utilizados Instrumentos de avaliação, como Índice de Desvantagem Vocal, Questionário de Qualidade de Vida M.D. Anderson, Universidade de Washington e World Health Organization Disability Assessment Schedule, além de amostra de fala e exames de videofluoroscopia da deglutição foram aplicados. Os resultados indicaram que a separação laringotraqueal foi positiva após o tratamento do câncer de cabeça e pescoço, pois possibilitou o retorno da via oral, visando restabelecer o prazer alimentar e a comunicação alaríngea. Concluímos que a melhora na qualidade de vida foi evidenciada e o estoma definitivo não teve impacto negativo na vida do paciente.

Palavras-chave: Câncer de laringe. Deglutição. Laringectomia Total. Qualidade de vida. Voz.

INTRODUCTION

In 2022, it was estimated that 20 million new cancer cases occurred worldwide [1]. Between 2020 and 2022, Brazil alone saw an estimated 625,000 new cancer cases. This figure represents 2% of all malignant diseases and 25% of malignant tumors in the country, predominantly affecting men over 40 years old, especially in the larynx and head and neck region [2]. Each tumor has its unique biology, and treatment planning requires knowledge of the patient's clinical conditions in addition to staging Surgery and/or radiotherapy and radiotherapy combined with chemotherapy may be adopted according to the location and extent of the cancer, according to the INCA *[National Cancer Institute]*. In advanced laryngeal tumors, total laryngectomy combined with radiotherapy is the preferred treatment for optimal survival outcomes [3]. It should be noted that this is a meticulous surgical intervention, resulting in functional sequelae, such as loss of laryngeal voice, swallowing difficulties, and a permanent tracheostomy [4].

According to the available literature, the main outcome measure in cancer patients has been survival, based on tumor control. However, recent emphasis has been placed on the overall quality of life implications when choosing a therapeutic approach [5].

The complexity of the work required in the rehabilitation of laryngectomized individuals demands an interdisciplinary approach that can address the patient's biopsychosocial aspects related to communication and nutrition [6]. Voice alterations, dysphagia, and difficulties in cervical mobilization can occur with varying degrees of severity depending on the therapeutic approach. In this context, the speech-language pathologist intervenes with the medical team, if required. Given their expertise, this professional becomes responsible for the evaluation, functional diagnosis, and rehabilitation of voice and swallowing functions in individuals affected by laryngeal cancer [7]. Therefore, it is crucial to enhance the well-being of patients by implementing actions that reduce pain and address social, physical, and emotional symptoms [8].

Considering their role in technical procedures that help identify the risk of bronchial aspiration, clinical speech-language pathology evaluation, and instrumental assessments like videofluoroscopy and videoendoscopy of swallowing are employed. Moreover, therapeutic programs include orofacial motor exercises to improve coordination, mobility, and strength of the remaining structures of the stomatognathic system; vocal and respiratory exercises; and functional swallowing training is conducted by offering food in specific consistencies and volumes, with progressive increases based on each patient's tolerance until safe and efficient oral intake is achieved 9.

Laryngectomized patients have special needs and must restructure their self-image, reintegrate into society, and find adaptive means to regain autonomy and participate in community life [10]. In view of the negative impacts on physiology, the patient's concerns, expectations, and goals are relevant in the therapeutic process [11].

From these considerations, the necessity and importance of investigating the functionality and quality of life of patients after functional total laryngectomy, are highlighted. It is well known that two individuals with the same condition may have different prognoses. When considering functionality, the ICF provides healthcare professionals with a broader, biopsychosocial approach. Environmental, social, and personal conditions are no less important than the presence of disease; it is necessary to emphasize the determination of function, activity, and participation of the individual with the disease [12].

Thus, this study aimed to analyze the effectiveness of voice and swallowing function rehabilitation compared to conservative treatment after functional laryngectomy, with an emphasis on quality of life. Although the literature emphasizes survival measures as a marker in oncology patients, the choice was made to highlight the importance of a quality of life approach, particularly regarding functional outcomes after head and neck cancer treatment, correlating these aspects with psychosocial factors.

METHODS

This is a descriptive study within the context of qualitative research, where the methodological procedures that supported it consist of data collection related to a clinical case. The study was conducted in 2020, focusing on the rehabilitation of voice and swallowing functions. The rehabilitation took place in a private clinic located in São Paulo-SP, while the initial treatment and prior follow-up occurred at the Hospital Beneficência Portuguesa.

This model highlights rehabilitation in the private clinic as the main focus of the study but also mentions the initial treatment at the hospital to provide complete context. Data collection was carried out at two time points: before total laryngectomy (M1-pre TL) and after total laryngectomy (M2-post TL).

The study was conducted according to the regulatory guidelines for research involving human beings and was submitted for evaluation by the Research Ethics Committee under number 5.369.727 of the School of Human Sciences and Health at PUC/SP. It was carried out with the express consent of the individual, who was clearly informed about the use of their data for research purposes and ultimately signed the informed consent form.

The qualitative approach of this study brings the perspective of fundamental characteristics to be interpreted for understanding the therapeutic process, which may be useful for reflection in the care of other patients with characteristics similar to those presented in the case to be described.

A male patient, aged 66, engineer, with a medical diagnosis of advanced laryngeal cancer (ICD-10 *[International Classification of Diseases]-* C32), who is also a smoker, and alcohol user, was selected for the study based on convenience and specificity. The biopsy found a vegetative lesion on the right vocal fold and ventricular band, associated with hemilarynx paralysis, with a histopathological diagnosis of well-differentiated squamous cell carcinoma staged as TNM cT3 N0. In 2006, conservative treatment was chosen according to the organ preservation protocol, with 25 sessions of radiotherapy with a radiation dose of 200 cGy, plus 10 sessions of radiotherapy with a radiation dose of 200 cGy, and exclusive chemotherapy with Cisplatin between 08/24/2016 and 10/24/2016, resulting in a complete response to the treatment, leaving the patient disease-free. During clinical progression, the patient showed worsening of functional aspects of voice, breathing, and swallowing, developing organic dysphonia secondary to oncological treatment and progressive dyspnea. Since January 2016, recurrent pulmonary infections due to bronchial aspiration were frequent, resulting in eight hospitalizations. In this context, based on the clinical condition, a tracheostomy (TQT) was indicated due to laryngeal lumen stenosis caused by ventricular band hypertrophy post-radiotherapy. Then, a nasoenteral tube was inserted, as oral feeding was no longer feasible due to the potential risk of bronchial aspiration. The patient, referred from Hospital Beneficência Portuguesa, was referred to the Speech-Language Pathology service in 2020 for speech therapy rehabilitation, aiming for safe reintroduction of oral feeding. The speech therapy sessions included exercises for laryngeal elevation, glottic coaptation, pharyngeal contraction, oral ejection, and the emission of high-pitched sounds.

The patient had partial improvement after six months of speech therapy, as assessed by the Rosenbek penetration-aspiration scale [13]. The nasoenteral tube was removed, but with a need for consistency limitation (honey-thick creamy and nectar-thick liquids, according to the manufacturer's instructions for the prescribed food thickener), classified according to the International Dysphagia Diet Standardisation Initiative (IDDSI) as level 3 for both categories.

A family and multidisciplinary meeting was held during the speech therapy process, in which the therapeutic limitations regarding functionality were discussed. Thus, in agreement with the family and the head and neck surgeon, it was decided to perform functional laryngectomy, also known as laryngotracheal separation with tracheoplasty, for the placement of the PROVOX® (8mm) tracheoesophageal prosthesis. Fifteen days after the prosthesis placement, speech therapy sessions began to rehabilitate vocal function, focusing on acquiring tracheoesophageal voice with emphasis on

maximizing articulation, precision of articulation points, speech coordination with breathing, and fluency.

Data collection was conducted at the beginning of the therapeutic process, represented as M1-pre TL, and at its conclusion as M2-post TL, considering the following data:

1. Voice Handicap Index (VHI-10) score, translated and adapted from the Voice Handicap Index protocol (JACOBSON et al., 1997) and validated in Brazil by COSTA et al. (2013) [14]. This instrument assesses the impact of dysphonia on the social, emotional, physical aspects, and daily activities of the individual. It consists of 10 questions, categorized into the following domains: functional, organic, and emotional. Each question is answered using a five-point Likert scale: never (0), almost never (1), sometimes (2), almost always (3), and always (4). The score is calculated by summing the responses, ranging from 0 (no handicap) to 40 (maximum handicap), or specific to each domain. A cutoff score of 7.5 is proposed (BEHLAU et al., 2016) [15].
2. The M.D. Anderson Quality of Life Questionnaire (MDADI), which analyzes the impact of dysphagia. This instrument was translated and adapted into Brazilian Portuguese by GUEDES et al. (2013) [16] and consists of 20 items, divided into: one global question, six questions for the emotional domain, five for the functional domain, and eight for the physical domain. The final score for each domain ranges from 0 to 100, with lower scores indicating a worse impact of dysphagia on the patient's quality of life. The value for each domain is calculated separately, with the sum of the values for each question divided by the number of questions and multiplied by 20 [17].
3. An auditory-perceptual analysis of the voice was performed using a speech sample composed of the sustained vowel /a/ and classified according to the GRBASI scale, which consists of six parameters: *G* - general degree of dysphonia; *R* - roughness; *B* - breathiness; *A* - asthenia; *S* - strain; and *I* - instability. All parameters were evaluated according to their presence or absence and the degree of severity, as follows: 0 - absent; 1 - mild; 2 - moderate; and 3 - severe.
4. Acoustic assessment was performed using the PRAAT V0.3 (06/14/2022) with the new script [18]. For this study, the parameters of intensity and duration of the voice sample were analyzed, consisting of the sustained vowel /a/, counting numbers, months of the year, days of the week, and the song "Happy Birthday."
5. Videofluoroscopic examination was conducted to assess swallowing.
6. The University of Washington Quality of Life Questionnaire (UW_QOL), translated and validated into Brazilian Portuguese by VARTANIAN et al. (2006)[19]. In its current version, it consists of twelve multiple-choice questions that cover the following quality of life domains: pain, appearance, activity, recreation, swallowing, chewing, speech, shoulders, taste, saliva, mood, and anxiety. Each question offers 3 to 5 response options with scores ranging from 0 to 100, and a "composite score" can be calculated, representing the average of the 12 domains and providing an overall picture of the individual's quality of life. A higher score indicates better quality of life [16].
7. The Brazilian version of the World Health Organization Disability Assessment Schedule (WHODAS), known as WHODAS 2.0, allows for a common measurement of the impact of any health condition in terms of functionality, translated and adapted into Brazilian Portuguese by SILVEIRA et al. (2013) [20]. It consists of 36 questions divided into domains: cognition, encompassing communication and comprehension; mobility, addressing movement inside and outside the home; self-care, related to hygiene, dressing, feeding, and living independently; interpersonal relationships, which study interaction with other people; life activities, concerning household activities, leisure, work, and school; and participation, related to community activities. The scoring ranges from 0 (best functionality) to 100 (worst functionality) [20].

An interview was conducted postoperatively when the patient was in the process of being discharged from assisted speech-

language pathology. It was conducted remotely and synchronously (considering the COVID-19 pandemic), with the patient reporting on moments M1-pre TL and M2-post TL.

RESULTS

Table 1 summarizes the procedures performed at both moments.

Table 1. Record of data collection procedures.

M1-pre TL	M2-pos TL
VHI-10	VHI-10
MDADI	MDADI
Auditory-perceptual analysis	Auditory-perceptual analysis
Acoustic assessment	Acoustic assessment
UW_QOL	UW_QOL
Videofluoroscopy	WHODAS 2.0
	Interview

Table 1 records this data and shows that at the M1-pre TL moment, the Vocal Handicap Index (VHI-10) was below the cutoff point considered for this instrument (7.5). After the surgery, the score was above 11, suggesting a worsening of the vocal handicap index immediately following the total functional laryngectomy, with improvement after speech therapy.

Regarding the MDADI, in M1-pre TL, the responses recorded an average between 41-60, considered a moderate limitation in the quality of life related to swallowing, and for the M2-post TL results, the average obtained was 81-100, considered minimal limitation.

Concerning the characteristics of the perceptual-auditory evaluation, in M1-pre TL, the following were recorded: *G* - general grade of dysphonia 2; *R* – roughness 1; *B* – breathiness 1; *A* – asthenia 0; *S* – strain 2, and *I* – instability 0. In M2-post TL, the following were recorded: *G* - general grade of dysphonia 2; *R* – roughness 2; *B* – breathiness 0; *A* – asthenia 0; *S* – strain 1 and *I* – instability 0. In other words, there were mild to moderate degrees of alteration at both moments, with greater roughness in M2-post TL, but with less breathiness and strain. In the acoustic assessment, the samples collected at M1-pre TL and M2-post TL of the patient did not present a contrast between voiced and voiceless consonants, so the voiced/voiceless contrast could not be processed. The others were extracted, and it was noted that in M1-pre TL, there was a short duration of sustained vowel, and in M2-post TL, there was an improvement in the duration and intensity of sustained vowel production, spoken, and sung voice. Regarding the UW-QOL, the average composite score found in both M1-pre TL and M2-post TL was 89.66. This indicates that there were no implications for the overall quality of life analysis, and the domains with scores below 100 were speech, taste, and saliva. The videofluoroscopy exam was used to evaluate swallowing. In M1-pre TL, two evaluations were performed one month apart to monitor dysphagia. In the first exam, the patient's swallowing pattern was classified as moderate/severe oropharyngeal dysphagia, level 2, while in the second exam, after two months of speech therapy, the swallowing pattern was classified as moderate oropharyngeal dysphagia, level 3, according to O'Neil et al. (1999) [21].

Table 1 – Description of data regarding vocal handicap index, quality of life questionnaires, and acoustic assessment.

	M1-pre TL	M2-pos TL
VHI-10	7	13
MD-ANDERSON	40	80
Emotional	43.33	86.66
Functional	44	84
Physical	47.5	82.5
ACOUSTIC ASSESSMENT		
Sustained vowel measurement	5,513 seconds	10.09 seconds
Sustained measurement		
Speech intensity	54.57 (uncalibrated)	75.54 (uncalibrated)
Sung part measurement		
Average singing intensity	57.65 (uncalibrated)	71.91 (uncalibrated)
Singing intensitv deviation	5.12 dB	4.33 dB
UW-QOL domains		
Pain	8.33	8.33
Appearance	6.25	6.25
Activity	8.33	8.33
Recreation	8.33	8.33
Swallowing	8.33	8.33
Chewing	8.33	8.33
Speech	5.59	5.59
Shoulder	8.33	8.33
Taste	5.59	5.59
Saliva	5.59	5.59
Mood	8.33	8.33
Anxiety	8.33	8.33
Total	**89,66**	**89,66**
VIDEOFLUOROSCOPY		
Videofluoroscopy M1-pre TL	Moderate oropharyngeal dysphagia level 3	
After 2 months of speech therapy	Moderate/severe oropharyngeal dysphagia level 2	

Table 2 presents the data collected in M2-post TL from the disability analysis, the WHODAS 2.0, and shows that the post-surgery data indicate adequate functionality, considering the patient's overall quality of life. In the analyses by each domain, no domain was found to be impaired.

Table 2. Description of WHODAS 2.0 data.

WHODAS 2.0	M2-post TL
Cognition	8
Mobility	7
Self-care	4
Interpersonal relationships	6
Daily activities	6
Participation	9
TOTAL	**40**

DISCUSSION

This study allowed for the evaluation of specific quality of life in voice and swallowing at two distinct points of speech therapy, namely M1-pre TL and M2-post TL, in a total laryngectomy patient following conservative laryngeal preservation treatment. As a descriptive study, it involved data collection through vocal disadvantage instruments, quality of life questionnaires, functionality assessment tools, videofluoroscopy, auditory-perceptual analysis, acoustic assessment, and interviews.

During the research, it was observed that the VHI-10, an instrument designed to assess dysphonia in social, emotional, physical aspects, and daily activities of the individual, is not focused on studying quality of life in patients with total laryngectomy. Thus, there is a noted deterioration in M2-post TL, which may indicate vocal disadvantage. However, upon examining the isolated domains of this instrument, it is evident that the complaints in M2-post TL are related to communication, suggesting an impact due to the surgery, which is expected in the immediate postoperative period [22].

The literature highlights the impact of oncological treatment, correlating dysphagia as a detrimental marker for patients, leading to functional and social limitations and nutritional deficiencies that affect quality of life 17.

In contrast, this study shows that quality of life related to dysphagia, as analyzed through the MDADI questionnaire scores, reveals that at M1-pre TL the limitation was greater (moderate dysphagia limitation), compared to the second moment (minimal dysphagia limitation), indicating a reduction in the impact on quality of life related to dysphagia [23].

Some excerpts from the patient's report will be presented to document the self-analysis of the patient during the therapeutic process.

> "I was no longer able to eat normally and had a nasoenteral tube for a year and a half until the medical team opted for tracheoplasty surgery for the repositioning of a speech prosthesis. Therefore, I was able to have a better quality of life, eating without a tube and reducing the risk of choking."

> "When I ate, I started to cough, a sign that my food was not going to the right place but to my lungs. During one of my hospitalizations, I had a respiratory arrest, and they performed a tracheostomy to save my life. Since then,

In the auditory-perceptual analysis of the voice, it was observed that the voice was rated as altered to a moderate degree in both analyzed moments. However, detailing the parameters, roughness increased in M2-post TL, but in contrast, breathiness disappeared and tension decreased, factors that may have contributed to a better understanding of the patient report. This data is supported by the acoustic assessment, as it is known that the tracheoesophageal voice predominantly features roughness. Comparing M1-pre TL, with laryngeal voice, and M2-post TL, with tracheoesophageal voice, shows a difference in the general parameters analyzed, including intensity and duration of the voice, demonstrating that the surgical procedure and speech therapy were beneficial for the patient, including voice issues. According to bibliographic research, the tracheoesophageal prosthesis showed considerably good indices and is recognized as the gold standard for tracheoesophageal voice compared to other alaryngeal communication methods in the study by Serra et al. (2015) 24.

The analysis of VHI-10, MDADI scores, and acoustic assessment suggests these factors can be considered prognostic for head and neck cancer treatment, providing a better understanding of what is most important to the patient, as well as a better assessment of results from a functional and psychosocial perspective, where quality of life becomes essential [23].

The UW-QOL quality of life questionnaire, considered the primary tool for assessing the quality of life in head and neck cancer patients, demonstrated a good quality of life in this study, showing advantages in dimensions such as pain, activity, recreation,

swallowing, mastication, shoulder, taste, mood, and anxiety. A closer reading reveals that the patient rated disadvantages in the domains related to appearance ("The change in my appearance is minimal"), speech ("I have difficulty saying some words, but I can be understood"), taste ("I taste most foods normally"), and saliva ("I have more saliva than normal, but it is still sufficient"). Despite these areas being marked as disadvantages, the overall score was considered satisfactory.

Good communication and the trust built with the team may also contribute to better treatment adherence. The patient's report exemplifies this:

> "After my decision, which was not easy, I had the surgery, and it was a success. Shortly after, I began speech therapy where I learned to eat and speak while always following my breathing timing. Today, I am very well, I eat without restrictions, and I can communicate with everyone without problems."

WHODAS 2.0 is a relatively new tool in our context that incorporates aspects of the International Classification of Functioning, Disability and Health Health (ICF). It is known that two patients with the same condition can have completely different issues related to functionality and capacity. In this direction, the ICF provides healthcare professionals with a better understanding of patients' daily lives. The goal is to understand the significance of the disease to the patient, highlighting the individual's potential despite the illness [25].

The ICF is still rarely used, particularly among head and neck cancer patients with total laryngectomy. Thus, levels of disability are not yet described in Brazilian literature. However, understanding aspects of functionality is extremely valuable post-treatment. Considering that responses are based on the past 30 days, the data analysis from the WHODAS 2.0 responses collected at M2-post TL shows no impaired domains. The patient's remarks indicate that how they managed the disease and the support received made a positive difference in coping with head and neck cancer treatment.

> "I thank everyone who accompanied me through this illness, seeking the best for me, and to all who go through this, I say, don't give up! My heartfelt thanks!"

CONCLUSION

This case study demonstrated that functional laryngectomy was beneficial following treatment for head and neck cancer, addressing the functional sequelae caused by radiotherapy and enabling oral intake to restore the pleasure of eating and the reestablishment of laryngeal communication. Improvements in quality of life were evidenced through functional analyses and quality of life assessment tools, showing enhancements in the patient's psychosocial aspects. The presence of a permanent stoma did not negatively impact the patient's life, as they had pre-existing laryngeal stenosis and there was no indication for decannulation, even after surgical intervention to enlarge the laryngeal aditus.

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