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CLINICAL IMPLICATIONS OF LARYNGE CANCER

Elisa C. Duccini
Student of the UNIFESO Medicine Course – Centro Universitário Serra dos Órgãos

Leandro de O. Costa
Professor of the Medicine Course at UNIFESO - Centro Universitário Serra dos Órgãos

Abstract: Introduction: Laryngeal cancer, the main neoplasm of the upper respiratory tract. It predominantly affects males. The indicated treatment varies according to the stage and extent of the tumor. Regardless of the treatment used, there can be damage to the voice, which affects the patient's dialogue and well-being. Therefore, determining the clinical implications associated with the different types of treatment becomes important, as well as the role of rehabilitation in this process. **Objectives:** To verify the clinical implications in laryngeal cancer. In addition to authenticating or contradicting whether there are benefits in vocal rehabilitation. **Methods:** Literary review, using 31 articles found in the main databases using DeCs descriptors, and selected articles in Portuguese, English and Spanish. **Results:** Through the studies it was possible to observe the existence of several treatment modalities that are used in this cancer, from radiotherapy to total laryngectomy. It also made it possible to visualize the increasing modification of the ideal treatment over the years, with the aim of improving disease-free survival and improving laryngeal function. Another point was in relation to vocal rehabilitation. While differences were found regarding the benefit of rehabilitation in patients undergoing radiotherapy, in patients treated with surgery, especially total laryngectomy, the benefit of vocal rehabilitation was very evident. **conclusions**: This review made it possible to verify the clinical implications of laryngeal cancer associated with its various treatments, in addition to confirming the effectiveness of vocal rehabilitation on voice and quality of life in patients with laryngeal cancer.

Keywords: Laryngeal neoplasms, organ preservation, rehabilitation, surgery, radiotherapy.

INTRODUCTION

Laryngeal cancer (LC) is the most common cancer that affects the upper respiratory tract and the second most routine among those that affect the respiratory system worldwide, second only to lung cancer.[1-3] Among the various types of cancers that affect the head and neck, laryngeal cancer is the most recurrent, representing 25% of all neoplasms in the area.[4-6] Regarding gender, this pathology predominates in males, in a ratio of 4 to 1 in relation to females.[3,6] This difference is possibly a reflection of the male gender exposure patterns to the main risk factors, highlighting the use of alcohol and smoking.[3,5,6.]

The treatment for this type of cancer is defined according to the stage of the disease, and may be by radiotherapy and/or chemotherapy, in association or not with surgical treatment.[7-9] Non-operative therapy is more likely to preserve the organ, and is sometimes used for this purpose, maintaining the structural and functional integrity of the larynx, in addition to reducing primary surgeries [2,3,7-9.]

Regardless of the type of treatment used, the quality of the patient's voice is affected.[2] Studies suggest that voice changes in patients with laryngeal cancer may appear up to ten years after the end of radiotherapy.[9,10] This treatment modality causes considerable damage to healthy tissues, due to its pathophysiological effect.[8] Long-term sequelae include tissue fibrosis, which may cause hypo or immobility of the vocal folds and aryepiglottic folds, as well as the cricoarytenoid joints.[8,10,11] Tissue scarring, inelasticity and sometimes glottal inefficiency can cause compensatory voice changes.[8,10,11.]

In addition to vocal alterations, taste alterations, dysphagia, accumulation of thick secretions, xerostomia, mucositis and reduced cervical mobility may occur.[3,7,11] Sometimes there is also chronic edema of the mucosa and

damage to the muscles, causing even greater damage to the laryngopharyngeal function, which may cause airway obstruction, dysphonia and aspiration, among others.[8,11,12] All these damages can impair the patient's quality of life.[11,12.]

The extent of functional impairments caused by the treatment can affect audible sound or cause a sensation of uncomfortable vocal formation, influencing communicative function, which is clearly related to quality of life and emotional distress.[12,13] Difficulty in communication promotes great mental burdens to the patient, which can ultimately result in social withdrawal and abandonment of relationships, even family, due to the inability to speak.[12] Patients still have anxiety and depression after hospital discharge[12] Several studies point to vocal rehabilitation training as beneficial for improving voice quality, communicative function and health-related quality of life.[2,9,10,13]

Given the predominance of laryngeal cancer among malignant head and neck neoplasms and its impact on the general population, the topic in question becomes important and can be considered a public health case. When associated with both physical harm (change in voice quality) and psychological harm (depression, anxiety and social withdrawal) resulting from the treatment used, the issue becomes even more significant.

As there are not many studies that correlate the appropriate treatment for the stages of laryngeal neoplasm, nor with the associated clinical implications, nor with the existence or not of benefits of implementing vocal rehabilitation, this literature review is necessary.

OBJECTIVES

Check the clinical implications of laryngeal cancer treatment through a literature review, prove or disprove the effectiveness of vocal rehabilitation for patients with laryngeal cancer.

METHODS

This is a literature review on the clinical implications in patients with laryngeal cancer. Initially on the VHL search site, the descriptors were used *laryngeal neoplasms surgery organ sparing treatments,* those found on the DeCs platform, search filters were used, with articles being searched only in the MEDLINE and LILACS databases; in English, Portuguese and Spanish, which have been published in the last 5 years, plus laryngeal neoplasms and treatments with organ preservation as the main subject, with 39 articles found at the end. Among these 12 articles were selected and the other articles were discarded. Such exclusion was due to the treatment of hypopharyngeal cancer, thyroid preservation, case report of a rare pathology; articles that were not in line with the topic.

A new search was carried out on the same search engine, selecting articles in the same databases, now using the following descriptors *Laryngeal Neoplasms Rehabilitation*, that were found on the DeCs platform, using the same previous filters plus laryngeal neoplasms as the main subject, 410 articles were found at the end, the title and abstract were viewed up to the 120th article on the list, among these 21 were selected, the others were excluded due to unrelatedness to the theme. However, only nineteen articles were used due to the impossibility of accessing the other articles in full. The research bases were consulted during the period from November 2020 to January 2022.

RESULTS

Treatment for the early stages of laryngeal cancer (LC) has the objective of preserving the organ, and can be performed with primary radiotherapy or organ-sparing surgeries.[14] A

study published in 2018 describes surgical possibilities that have been implemented as a form of organ preservation, including: open partial laryngectomy, transoral laser microsurgery (TLM) or transoral robotic surgery (TORS).[14]

This systematic review also emphasized in a comparative way the functional results for radiation and LC surgery, among the parameters studied are aspiration, swallowing dysfunction, voice results and quality of life.[14] In the aspiration parameter, the average incidence rate of patients undergoing primary radiotherapy was 14.5%, while in patients undergoing surgical modalities the incidence was 3.7%.14 As for swallowing, only patients undergoing surgery had dysfunction.[14] Regarding quality of life and vocal function, no significant differences were found between the groups.[14]

Radiotherapy (RT) has been shown to be more tolerated by patients, in addition to preserving laryngeal structures and having good oncological results.[14] However, it has some disadvantages such as the appearance of acute mucositis, odynophagia, dysphagia, hoarseness, among other changes, patients still have a high risk of local recurrence and, due to the implementation of primary radiotherapy, the only treatment option in the recurrence is total laryngectomy (LT).[14, 15]

Surgery with organ preservation, in turn, is more cost-effective when compared to RT, keeps the possibility of identifying hidden metastases when neck dissection is associated, can be used as a primary treatment and in cases of recurrence it can still be implemented.[14] However, it has disadvantages such as the risk associated with general anesthesia, recommended for the procedure, risk of infections and bleeding, possibility of fistula formation, dysphagia and risk of laryngectomies.[14] Endoscopic and transoral TLM and TORS surgeries have a lower cost and length of stay when compared to open partial laryngectomies, in addition to the lower incidence of permanent tracheostomy.[14, 16]

Through a study that analyzed randomized clinical trials and meta-analyses, it was possible to conclude that there is no great favoring between organ preservation techniques in relation to oncological results.[16] Regarding the rate of local control, endoscopic surgeries present 82.8% of control, while radiotherapy has 73.2%, in relation to disease-free survival in 5 years, the numbers are 83.7% in surgeries versus 68.0% in radiotherapy, when observing global survival the difference is insignificant 92.8% versus 90.6 and for laryngeal preservation inexpressible differences 98.2% versus 97.2% respectively.[16]

According to the retrospective cohort study carried out in 2021 in São Paulo, where the surgical modality used as a therapeutic method was partial oral laryngectomy was compared to radiotherapy as the treatment of choice, the overall cancer survival rate in the study groups weighed in favor surgery, being 89.2% as opposed to 86.7% in the radiotherapy group.[17] As for disease recurrence, the rates were 12.5% for surgery and 37.5% for radiotherapy.[17] This study also describes a high number of complications in patients undergoing salvage partial laryngectomy, these being an increase in the time of decannulation and parenteral feeding, in addition to the high risk of recurrences associated with RT.[17]

For locally advanced neoplasms, stages III and IV until 1990, initial treatment was performed only through total laryngectomy, based on the Veterans Affair (VA) study, which took place in 1991, and later with the protocol of the Radiation Therapy Oncology Group (RTOG), published in 2003, this perspective was changed, being initially implemented as an alternative to the use of induction chemotherapy followed by

radiotherapy and later adopting concomitant chemoradiation, the latter being implemented as a way of preserving the larynx in advanced stages.[18,19,20] However, several studies discuss the effectiveness of therapeutic possibilities.

Late toxicity evidenced by a study carried out in Korea in 2020 has an incidence of 10 to 26.5% of toxicity correlated with the use of concomitant chemoradiation as initial treatment, resulting in dysphagia due to stricture or the presence of esophageal aspiration.[21] The superior constrictor muscle of the pharynx is related to the presence of dysphagia, exposure to radiation can cause fibrosis of muscle fibers.[21]

Through a retrospective study, it was possible to observe that the group that received concomitant chemoradiation (CCRT) had a better rate of preservation of the disease-free larynx at 3 years compared to the radiotherapy group (68% versus 44%), both subgroups were in the organ-sparing therapy group.[22] Still on this study, in relation to disease-free survival at 3 years, patients undergoing total laryngectomy had better rates when compared to those undergoing organ preservation therapy, being 73.2 versus 55.7, however, the difference in survival overall is negligible across groups.[22] Regarding local metastases, the surgical group stood out with a lower percentage of recurrence.[22]

Another study confirms that patients with advanced stage laryngeal cancer undergoing TL associated with postoperative radiotherapy had an 18% survival advantage when compared to patients undergoing chemoradiotherapy, laryngeal preservation was 48% in the long term and, in compared to regional control after 3 years, surgery associated with radiotherapy had a superiority of 94% versus 53% for chemoradiotherapy.[23] Overall survival is 70% for patients undergoing combination treatment versus 41% for patients treated with chemoradiotherapy, respectively.[23]

As a consequence of treatment in the advanced stages of the disease.[23] Patients undergoing initial CCRT in the face of the need for new radiation are at risk for the occurrence of chondroradionecrosis, severe congestion and a shorter disease-free time.[23] In cases of local recurrence, the appropriate treatment is TL.[23] Patients who underwent TL plus radiotherapy as initial treatment had reduced swallowing function as complications.[23]

Recently published studies address the issue of less radical surgeries as a possible treatment for more advanced stages, leaving TL only for tumors with extralaryngeal dissemination and in local recurrences.[24] A study carried out in Poland in 2021 reports that the number of TL has been reduced in recent years, between 2009 and 2018, in contrast, partial laryngeal resection procedures have remained unchanged.[25] Among partial resections, there was an increase in transoral laryngeal microsurgery and a consequent reduction in the rate of open partial laryngectomies.[25]

The conservative surgeries that are represented by Open Horizontal Partial Laryngectomies (OPHLs) are treatment approaches that can be used in the early stages and in some advanced stages, up to stage T4a on a selected basis.[26,27] OPHLs represent safe oncological procedures and, as reported by several authors, have an excellent overall survival, disease-free survival, and TL-free survival.[26]

A retrospective study made it possible to verify that the recovery of the main laryngeal functions (swallowing, breathing and voice) is satisfactory, after performing OPHLs as the first choice method.[26] Mainly in type I OPHLs, a method in which the vocal folds are spared, in subtypes II and III there is a high deterioration of this structure.[26] Another function that is largely affected by OPHLs is swallowing, in most cases the dysfunction resolves within six months, however aspiration

may persist, leading to an increased risk of pneumonia and death.[26]

Supracricoid laryngectomy (SCL) has recently been included in Type II OPHLs.[27] Among the postoperative complications associated with this type of surgery, laryngotracheal stenosis has a negative impact on sequelae, chronic aspiration is controversial being reported through a literature review, where 17% of the study patients had worsening of symptoms during meals , in addition to 68% of patients having swallowing disorders and different degrees of aspiration.[27]

Compared to the prognosis between SCL and LT, the results are extremely competitive, however, SCL has an advantage for guaranteeing the main laryngeal functions and not carrying the need for permanent tracheostomy, inherent to LT and which has the catastrophic consequence of loss of natural phonation, in addition to being associated with greater morbidity.[27,28]

Early mobilization of structures through rehabilitation makes the appearance of local fibrosis difficult, which is sometimes associated with a failure of the intervention, therefore requiring TL.[27] LT drastically modifies both the patient's phonation and the anatomical structure.[27]

A study carried out in Italy in 2021 describes a rehabilitation protocol implemented in its analysis, which must be started on the second day after surgery, in order to obtain favorable results.[27] Initially, breathing exercises are performed, which strengthen the preserved structures, followed by swallowing exercises.[27] These exercises allowed decannulation around 2 to 3 days after the surgical procedure.[27]

The vocal rehabilitation that is implemented by speech therapists, in the initial stages in which patients were submitted to radiotherapy, this modality has some uncertainties about its effectiveness.[3] In a study where the average follow-up was three months, this exposes the relevance of the speech therapy team's performance in vocal rehabilitation to improve the patient's health.[3] In contrast, a study carried out in the Chinese population, with follow-up of ten consultations, reported that vocal rehabilitation may not benefit patients after radiotherapy.[2]

A study carried out in 2018 qualitatively and quantitatively analyzed the properties of the sound wave before and after radiotherapy and also after rehabilitation, this obtained results that demonstrate an important change in the voice from pre to post rehabilitation, however when compared pre and post radiotherapy In rehabilitation, the changes were not so drastic, only the difficulty in initiating phonation (previously not perceived) and the presence of noise during the entire exam were reported (in the pre exam, only one noise was described).[11] Depending on the patient, there were reports of improvement in voice-related problems or even persistence of pre-treatment misfortunes in a similar way.[9]

Some studies carried out an analysis through the application of the GRBAS scale that assesses the degree, roughness, breathiness, asthenia and effort; being possible to verify the vocal quality, through the perception of the patient, or of an external examiner.[2,11] One study, despite having obtained a reduction in the values of the scale, the degree of severity remained equivalent in most of the parameters pre-treatment and post-rehabilitation, however the degree of roughness had a reduction only after rehabilitation.[11] In contrast, another study shows unpromising results, measured by the GRBAS scale 3 months after the intervention.[2]

A method used by some studies was the quality of life questionnaire ECORTC CORE-30 (QLQ-30), by some even added to thirty-five specific items in the head and neck area, which has the function of evaluating physical and psychosocial functioning, and

the symptoms experienced by the patient.[9,11] According to the results presented in the study, patients who underwent the rehabilitation process had no significant complaints, except for fatigue.[9] A similar questionnaire was implemented in a study carried out in 2018 in Argentina, being applied before and after treatment and also after rehabilitation, where the information presented in Table 1 was found.[11] There was also a significant improvement in financial difficulties, in the function domain, in social function, in the overall quality of life, in speech and in social contact in the intervention group.[9]

	Pre-treatment	After treatment	Post-rehabilitation
Functional Scale	28	37	0
Physical Scale	37	40	2
Emotional scale	30	34	0
Total Score	95	111	2

Table 1: Quality of Life Measurement

Source: Valverde MS.[11]

The rehabilitation method used in the study includes relaxation, breathing, posture and phonation exercises.[9] The performance of vocal training on a daily basis was requested from the patients in the intervention group.[9]

Individuals with advanced laryngeal tumors without the possibility of conservative treatment or who have local recurrence and who underwent TL have three main forms of rehabilitation, namely: esophageal voice, electronic larynx and tracheoesophageal prostheses.[3] In Brazil, the esophageal voice is the most used technique for rehabilitation, due to its low cost, and three speech-language pathology methods can be used for this result: injection or aspiration of air into the esophagus and swallowing.[3,7] Through the results of a study carried out in 2020 in São José do Rio Preto (SP), it was possible to verify that patients with stage T1 and T4 tumors obtained clinical improvement in both dysphagia and dysphonia, mostly, stage T1 improves dysphonia and the stage T3 the development of esophageal speech.[3]

A study carried out in Japan in 2019 with 27 participants, most of whom underwent total laryngectomy, showed that 27.8% of patients lost their jobs before the surgery, and this figure increased to 40% after one year of the procedure.[12] This increase throughout the year was correlated with loss of voice, thus affecting occupancy status.[12] Another aspect analyzed was the mental health of the patient, with an anxiety associated with the need to support the family being reported, however the study showed that patients who live with one or more family members have better mental health when compared to those who live alone, so family support is important.[12]

Social commitment was also analyzed and the results showed that social interaction had a significant reduction in the first three months, with a worsening at six months after surgery, when compared to the pre-surgical period.[12] These evidences may be related to communication difficulties, sometimes leading to non-relationships, even with family members.[12] Patients have reduced physical function, dysphagia, reduced appetite, low water and food intake, difficulties in daily living during the first year after surgery, time elapsed from the research.[12]

The cross-sectional study analyzed the speech-language pathology profile of the patients, using as a parameter the presence of alterations in the functions of the facial structures and the region's autonomous nervous system (speech and voice and swallowing).[3] The results showed that the patients did not suffer alterations in the stomatognathic system, but in relation to the neurovegetative system, 49% of the patients

submitted to partial laryngectomy had alterations in the development of speech and voice and/or 64.22% of oral communication.[3] Among the participants submitted to total laryngectomy, 22.55% developed esophageal speech and 21.57% developed writing and gestures.[3] The study also showed that the effects of speech therapy are associated with schooling, due to the fact that most patients who developed gestural communication did not have schooling.[3]

DISCUSSION

The larynx has essential roles such as protecting the airways during swallowing and breathing, being affected both by laryngeal cancer and its treatments.[8] The larynx tumor has a variable treatment according to the stage of the disease.[7] In patients in stages I and II, the preservation of the organ and its functionality has been more indicated, for this purpose, radiotherapy (RT) in association or not with chemotherapy has been adopted as a treatment in the last three decades.[4,7,8] In stages III and IV, the indicated treatment is related to longer time without the presence of disease and/or absent interventions for two years or more.[7] In a basic way, surgical treatment can be implemented at any stage of the disease, depending on the affected site and extent of the cancer, and endoscopic approaches, partial or total laryngectomy can be performed.[7,16]

Radiotherapy and surgeries, especially endoscopic ones, have undergone a significant evolution of their techniques over the years, aiming to reduce the resulting side effects.[16] Although radiotherapy has been adopted in the last three decades as the main method of preventing the organ in patients with LC, studies have comparatively analyzed the use of surgery as a form of treatment for the early stages of the disease.[7,8,17]

The main surgeries adopted for the initial stages were open partial laryngectomy, transoral laser microsurgery (TLM) or transoral robotic surgery (TORS).[16,17] Through two studies, where the topic was debated, it was possible to establish that in relation to overall disease-free survival there was no significant difference between the surgical modalities and radiotherapy, however when analyzing local recurrences the incidence is higher in patients undergoing primary radiotherapy.[14,16,17] In addition, the 5-year disease-free survival is superior in the initial surgical treatment.[14,16] Carvalho et al (2021) states a greater laryngeal preservation in patients who underwent surgery when compared to radiotherapy, even though the numerical differences are not significant.[17]

Radiotherapy has the capacity for laryngeal preservation and good oncological results, however patients undergoing this treatment may have hoarseness, acute mucositis, dysphagia, odynophagia, among other changes.[16] In the case of surgeries, in addition to also having good oncological results, then associated with the best cost-benefit, but for the realization of this form of treatment there is a need for general anesthesia, which in itself presents a risk in addition to the patients being able to evolve with infections. , bleeding, dysphagia and the appearance of fistulas.[16] Both treatment modalities have advantages and disadvantages.

Another important point that must be taken into account when choosing the treatment is the presence of relapses and their therapeutic approach.[29] According to the studies and corroborated by Piazza et al (2021), patients undergoing RT as primary treatment sometimes require salvage therapy due to high local recurrence.[14,15,29] The main rescue therapeutic modality implemented is TL due to the changes in the tissues caused by RT, in addition to the use of conservative surgeries being difficult.[29]

Until 1990, the treatment adopted for locally advanced laryngeal cancer was total laryngectomy, this perspective changed from 1991 with the introduction of induction chemotherapy associated with radiotherapy, through the VA study in 2003 through the RTOG chemoradiation protocol. concomitant therapy was implemented as main therapy in stages III and IV.[18,19] This therapeutic approach together with RT could be found in the group of measures performed for organ preservation, however preserving the laryngeal structure does not guarantee its functionality.[22,28] Therefore, new approaches are being discussed.

According to the studies by Nair et al (2018) and Eskander et al (2018), when comparing the disease-free survival for the LT and LT groups associated with RT between the CCRT and RT groups, a superiority of approximately 18% of the surgical groups (LT and LT+RT), these same groups stand out with a lower recurrence and greater regional disease-free control at 3 years, in relation to overall disease-free survival, the findings were not significant between LT versus CCRT and RT, but for the LT+RT versus CCRT ratio, the surgical group had a superiority of approximately 29%.[22,23]

In an analysis comparing laryngeal preservation between CCRT and RT, it was possible to show that CCRT acts more effectively in this parameter.[22] However, according to Gene et al (2020), late toxicity related to the use of CCRT was found to be relatively high and has been related to dysphagia and esophageal aspiration that occur after treatment.[21] In relation to patients undergoing LT+RT, the main sequelae acquired with the treatment was the change in swallowing.[23]

Some studies have addressed conservative surgeries, which are represented by Open Horizontal Partial Laryngectomies (OPHLs), as a therapeutic modality capable of replacing LT in advanced stages, being incorporated until the T4a stage.[24,26] OPHLs are divided into three types: Type I (supraglottic laryngectomy), Type II (supracricoid laryngectomy) and Type III (supratracheal laryngectomy), and the type of surgery to be performed depends on the affected structures.[26] Voice quality is generally favorable after Type I surgeries due to preservation of the vocal cords, in Type II where supracricoid laryngectomy (SCL) is included, the voice undergoes modest or high changes in roughness and degree, moderate to mild in breathiness and mild in asthenia, voice deterioration in Type III is similar to that of II.[26,27]

The preservation of vocal and laryngeal function is always recommended, SCL represents one of the alternatives adopted to replace TL, because in addition to being adopted as an initial treatment, it can also be indicated in cases of extralaryngeal dissemination and local reinfections.[1,27] However, TL are currently the most indicated and adopted for tumors that have an extralaryngeal spread and in cases of local recurrence, in which no other approach can be performed.[24]

OPHLs have excellent overall survival, disease-free survival and TL-free survival, in addition to having the aim of preserving laryngeal functions: phonation, swallowing and breathing.[18,19] In contrast, LT is not capable of performing this laryngeal preservation due to the need for a definitive tracheostomy, which makes communication between the upper and lower respiratory systems impossible, since in this procedure part of the laryngeal structures is removed, thus leading to loss of phonation and natural breathing.[7,27,28] Swallowing is largely affected by OPHLs, however this functionality is recovered in around six months, but persistent aspiration can lead to an increased risk of pneumonia.[26]

Ralli et al (2021) describe that early

movement of the treated site may favor the non-appearance of scar fibrosis, in addition to a reduction in intervention failure.[27] This movement is performed through rehabilitation and, according to Ralli et al, it is necessary to introduce a rehabilitation protocol so that the "new larynx" has its function preserved.[27]

Patients undergoing radiotherapy have several sequelae that cause changes in quality of life.[4,13] The role of vocal rehabilitation in improving sequelae and quality of life is being widely studied. Currently, there is no consensus regarding the methodology and follow-up time that must be applied in vocal intervention.[30] Several studies used phonation, breathing, posture and relaxation exercises as an intervention method.[9,13,30] The most described follow-up was performed during ten consultations with the speech therapist, over ten weeks, in a period of up to six months after the end of radiotherapy.[2,9,13,30]

A study carried out by Zhang et al (2018) described that rehabilitation may not benefit post-radiotherapy patients, however Karlsson et al (2015) showed a clinical improvement associated with vocal rehabilitation, this finding was corroborated by the studies carried out by Bergstrom et al (2017), as well as by Millgard et al (2020).[2,9,13,30] Through the case report carried out by Valverde et al (2018), an improvement in the voice was described qualitatively and quantitatively, this finding was ratified by statistical analyzes carried out by Millga et al. to the healthy group after 24 months, being 52.6% of this group considered with normal voice, however the control group presented inferior results, being only 42.3% considered with voice without alterations.[11,30] Therefore, vocal rehabilitation implemented with the appropriate methodology and follow-up described above are effective in improving speech.

However, the results were not congruent in the different studies that used the GRBAS scale as a parameter, it has the function of numerically evaluating the voice quality, through the parameters degree, harshness, breath, asthenia and effort.[2,11] The results were different, while Valverde et al (2018) through their case report confirm the benefit of vocal rehabilitation, Zhang et al (2018) describe unpromising numbers.[11,30] On the other hand, Silveia et al (2018) report immediate improvements in harshness and breath, maintaining the benefits 4 minutes after performing the vocal technique, which uses the phonation of prolonged /b/, another parameter that was benefited is the degree , the same remained favorable for 5 minutes after performing the technique.[31]

Regarding the surgical treatment, the implementation of partial and total lagintectomy causes damage to the voice and can be present from roughness, breathiness and reduced intensity to the loss of oral communication.[6,31] The loss of voice and sometimes of communication is associated with a high occurrence of mental disorders in laryngectomized patients, among them anxiety is notorious, which may be due to the loss of a job in association with the need to support the family, being therefore a important health indicator.[6,12] The speech therapy team can provide some communication alternatives, among them the tracheoesophageal valve, the electrolaryngeal voice, the esophageal voice, among others.[3,6,7]

One of the rehabilitation methods described in the literature review carried out by Papuzinski et al (2018) is the production of the esophageal voice, which consists of swallowing air and consequently insufflating the esophagus. passing through the upper portion vibrates the structures generating the sound.[6,7] This method of communication is the most used in developing countries, as well as in Brazil, however its effectiveness depends on the patient's motivation.[3,6,7]

Another way to reestablish the communication of the patient described in the literature is the prosthesis or tracheoesophageal valve, this technique consists of placing a device in a surgical way that allows the communication of the trachea with the esophagus, the air is channeled from the lungs to the esophagus and later directed the pharynx and oral cavity, through the digital occlusion of the prosthesis.[6,7] In the bibliography, electrolaryngeal voice is also found as a form of rehabilitation. In this method, an oscillator device is implanted in the patient's neck, this equipment captures the vibration of the hypopharyngeal wall and redirects the oral cavity to produce the voice.[6,7]

Regarding the possible methods described for the rehabilitation of patients undergoing TL, it is possible to verify that despite the esophageal voice being the most implemented in several countries, it has a lower success rate.[6,7] The implementation of the electrolaryngeal voice has a lower level of satisfaction, even though the rehabilitation is simple.[6,7] The tracheoesophageal valve has been shown to be favorable compared to the electropharyngeal voice, patients undergoing the valve have a more favorable level of satisfaction, in addition to improving confidence and, consequently, social interaction.[6,7]

Rosa et al (2018) describes as a possible form of incentive to remain in vocal rehabilitation, the participation in a choir of patients after CL treatment obtained esophageal or electrolaryngeal voice or have a tracheoesophageal prosthesis, this activity was described at the Cancer Institute of São Paulo. Paulo (ICESP), and in addition to intellectual improvement, this practice helps in respiratory control during speech.[7]

Studies show improvement in voice quality in patients after LC, who underwent rehabilitation.[13] The voice is a unique characteristic of each individual, in addition to being the main way of communication for men, therefore, it is correlated with individual personality and social life, which can lead to a reduction in social interaction.[6,12] Through the study carried out by Bergstrom et al (2017), it was possible to show that the patient's mental health interferes with health-related quality of life (HRQoL), which may precipitate the emergence of anxiety and depression.[13] The results showed that the group of patients undergoing vocal rehabilitation has a lower rate of anxiety and depression when compared to the control group, even twelve months after treatment.[13] In the HRQoL, several studies emphasize the association of these changes with the performance of speech therapy.[10,13] Due to the fact that through vocal rehabilitation there is an improvement in function, consequently an effective communication and also a reduction in social commitment, these cause a reduction in psychological impairments and consequently an improvement in HRQoL.[13]

CONCLUSION

Through this literature review, it was possible to verify that regardless of the different modalities of treatments implemented from stage I to stage IV, all of them have clinical implications for the physical and mental health of the patient. Chemoradiotherapy is related to late toxicity, in addition to dysphagia and esophageal aspiration that may arise after treatment. Radiotherapy was associated with a higher rate of recurrence, which consequently leads to salvage total laryngectomy. In addition to having as a consequence hoarseness, acute mucositis, dysphagia, odynophagia, among other changes. In the initial surgical treatments where open partial laryngectomy, transoral laser microsurgery (TLM) or even transoral robotic surgery (TORS) are adopted, these have less impact on laryngeal functionality.

The review also made it possible to show

that in advanced cases up to the T4a stage, the main modalities to be used are OPHLs that have less impact on laryngeal function when compared to CCRT, RT and LT, and are considered safe oncological procedures. LT surgery is reserved in cases of local recurrence, in cases of locoregional tumor advancement or in cases where another treatment modality cannot be implemented, this treatment modality leads to the loss of the natural function of phonation and breathing, as it requires a permanent tracheostomy.

This literature review also made it possible to confirm that vocal rehabilitation is largely related to improving the quality of voice and life of patients who underwent treatment for laryngeal cancer through radiotherapy, as well as those who underwent surgical treatment.

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