

## The Beginning of Vocal Rehabilitation and Quality of Life of Laryngectomated Patients

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### Abstract

#### Aim

The aim of this study is to examine the impact of vocal rehabilitation on the quality of life of patients after total laryngectomy.

#### Method

A subjective speech assessment was conducted by the University of Michigan Quality of Life Instrument - HNQOL. Respondents were given the task of choosing the offered answer for each of the above mentioned questions, expressing their opinion about the possibility or success of communication, the possibility of chewing/feeding food, pain and emotional state. In statistical processing, the arithmetic mean was used with the corresponding standard deviation, as well as the minimum and the maximum, then the frequency, percentages and t-test. The difference between the groups was tested using a single-factor variance analysis (ANOVA).

**Results**

Based on the results achieved on the HNQOL scale, all respondents had a problem in the described domains before vocal rehabilitation, which negatively influenced their quality of life. After vocal rehabilitation, improvements were made on all the supplements as well as on the overall score.

**Conclusion**

Vocal rehabilitation has positively influenced the quality of life of these patients and allowed return to normal life activities.

**Introduction**

Larynx carcinom is one of the most common malignant tumors of the head and neck, which leads to a change in normal anatomical relationships in the neck, causing a disorder of communication and a change in the psychosocial status of the patient. Head and neck tumors can affect and damage important functional and anatomical structures related to the physical appearance of the person, ability to speak and communicate, and lead to social interaction and a decline in quality of life [1]. Total laryngectomy is a radical procedure that leads to permanent loss of the generator and part of the voice, larynx, in which the basic laryngeal tone is created [2]. It is performed if the tumor of the larynx has advanced (designated as T3 and T4) and it is not possible to do any partial laryngectomy.

It exposes the patient with great psychological stress, both due to the basic disease and the loss of a very important organ in the general functioning of the organism [2]. The result of total laryngectomy are physical and functional changes that affect the emotional wellbeing of the patient and some of the most basic functions of life, breathing, swallowing and communication [3].

About 95% of cases of larynx carcinom are caused by excessive consumption of tobacco and/or alcohol, human papillomavirus (HPV type 16), and poor socioeconomic conditions. Head and neck tumors occur mostly in the age of 50 to 70 years [4].

Rehabilitation of the voice of laryngectomized patients is a very important type of rehabilitation that enables patients with severe speech disability easier resocialization and maximally alleviate severe psychological, social and professional problems [5]. It starts practically from the moment when the patient declares that the larynx must be surgically removed. There are three models of speech for patients after total laryngectomy: esophageal speech, electrolaryngeal and tracheozofageal speech. Speech rehabilitation integrates elements of psychological and social rehabilitation. It is desirable that one or more well-spoken rehabilitated laryngectomy patients are shown in the preoperative preparation of the patient, which will demonstrate their speech abilities, emotional and social stability.

Quality of Life - QOL is currently the most current concept of modern science. It is generally conceived as a multidimensional term, because it includes a wide spectrum of aspects, including physical, functional, emotional and social well-being, and satisfaction. This is subjective, because it can be understood only from the patient's point of view [6,7].

In medicine, effort is not only focused on quantity: to preserve life and health, but also to the quality of life in health and disease [8]. The quality of life is a multi-dimensional concept that includes physical, emotional, mental, behavioral and social components [9].

The great influence on the quality of life of the laryngectomized patient has the personality traits, as well as the previous way of life, social relations, interests [10].

The aim of this study is to examine the impact of vocal rehabilitation on the quality of life of laryngectomized patients.

## **Materials and Methods**

### **Sample**

The study involved 50 patients after total laryngectomy, aged from 51 to 83 years. The research was conducted at the JZU Hospital "Sveti Vračevi" in Bijeljina and the Military Medical Academy in Belgrade. Data on sex, age, education, smoking, the time when the rehabilitation started, the model of vocal rehabilitation and the length of the treatment were collected through a questionnaire and an interview with the patient.

### **Instruments and Procedures**

A subjective assessment of the voice was carried out using the Likert-type instrument, the University of Michigan Quality of Life Instrument - HNQOL [11]. This instrument is used to assess the quality of life of patients with head and neck cancer. It has been translated into a number of languages and adapted to various cultures. For our speaking area, it was adapted by Petrović-Lazić, Bunijevac in 2014. The instrument contains 30 offered questions, 20 of which are used for scoring four domains of life quality assessment: communication (4 items), chewing/swallowing food (6 items), pain (4 items) and emotions (6 items). Respondents were asked to choose the offered answer for each of the above questions, with expressing their feelings and their opinions about the possibility or success of communication, the possibility of chewing/feeding food, pain and emotional state. The HNQOL scale can also be used to assess the patient's satisfaction with treatment or treatment, but also by comparing the same satisfaction before and after treatment.

The scores of the received responses are made from one to five, so a greater score represents a better satisfaction of the patient with treatment, a better health condition and, therefore, a better quality of life.

The data was collected on two occasions. Patients filled out the questionnaire for the first time when they entered the logopedic clinic, before commencing the treatment, and the second time after its completion.

## Data Analysis

Statistical data processing used descriptive measures, arithmetic mean with corresponding standard deviation, as well as minimum and maximum. Frequency and percentage were also used. One-factor variance analysis (ANOVA) tested the difference between the average of the given sample, or whether the control variable (the beginning of vocal rehabilitation) influenced the quality of life of patients undergoing total laryngectomy, before and after vocal rehabilitation. In addition to ANOVA, a t-test for dependent samples was also used. Statistical processing and analysis was done in the computer program SPSS version 20 (Statistical Package for the Social Sciences).

## Results

The study involved 50 patients after total laryngectomy, 47 male and 3 female respondents (Table 1).

*Table 1: Structure of the sample in relation to gender*

	frequency	percentage
<b>Male</b>	47	94,0
<b>Female</b>	3	6,0
<b>Total</b>	50	100,0

*f - frequency; % - percentage.*

The age of the subjects ranged from 51 to 83 years, the average age of the respondents was  $62.6 \pm 7.32$ .

All subjects (100%) in this study were active smokers. The length of the smoking experience ranged from 20 to 55 years, the average length of the smoker's time was  $35.8 \pm 6.16$ .

In this study, patients were mastered with two speech models, namely esophageal and electrolysis speech (Table 2).

*Table 2: Structure of the sample according to vocal rehabilitation model*

	f	%
<b>Patients managed to esophageal speech</b>	44	88,0
<b>Patients using electrolytes</b>	6	12,0
<b>Total</b>	50	100,0

*f - frequency; % - percentage.*

Table 3 gives a presentation of patients according to the time they started with vocal rehabilitation. In 47.7% of patients, early vocal rehabilitation was conducted. The rehabilitation started mostly 3-4 weeks to two months after the completion of the surgical treatment. Late vocal rehabilitation was performed in 52.3% of patients, after completed air therapy or combined air and chemotherapy, and started from six months to one year after surgery. Both would begin as soon as the patient's local and general condition allowed.

Vocal rehabilitation lasted from one month to 12 months. The average duration of vocal rehabilitation was  $3.3 \pm 1.8$  months. Long-term vocal rehabilitation had patients who successfully mastered the esophageal speech, and three to five treatments had patients who mastered the electro-partial speech. These patients were working on finding an adequate position on the neck where the apparatus would be placed, whose vibrations activated the air in the gut and oral cavity. When the patient was mastered by placing the device and by properly generating sound, it was used to say phrases and sentences, and then on a conversation.

**Table 3:** Overview of respondents according to the time of vocal rehabilitation

	<b>Early vocal rehabilitation</b>	<b>Late vocal rehabilitation</b>	<b>Total</b>
<b>Esophagous speech</b>	21	23	44
	47,7%	52,3%	100%
<b>Electrolaryngeal speech</b>	0	6	6
	0,0%	100%	100%
<b>Total</b>	21	29	50
	47,7%	58%	100%

One-factor variance analysis (ANOVA) was tested whether subjects with different initial vocal rehabilitation (early and late) differed according to the scores on the HNQOL scale prior to treatment. It has been established that there is no statistically significant differences in either subscale or on the total scale of the scale (Table 4).

**Table 4:** HNQOL, before the beginning of vocal rehabilitation

		<b>Chewing/ swallowing food</b>	<b>Communication</b>	<b>Emotion</b>	<b>Pain</b>	<b>Total</b>
<b>Early vocal rehabilitation</b>	$\bar{x}$	52.00	6.48	16.66	47.45	49.45
	SD	28.59	9.72	15.37	18.93	18.93
<b>Late vocal rehabilitation</b>	$\bar{x}$	56.15	4.89	16.66	54.07	56.07
	SD	24.12	7.28	15.28	15.83	15.83
<b>Total</b>	$\bar{x}$	53.91	5.75	16.66	50.50	52.50
	SD	26.45	8.64	15.17	17.71	17.71
	F	.303	.416	.000	1.76	1.76
	p	.585	.522	1.00	.191	.191

$\bar{x}$  – arithmetic mean, SD – standard deviation, F – f test, p – statistical significance

A single-factor variance analysis (ANOVA) was examined whether subjects with different beginnings of vocal rehabilitation differed from scores on the HNQOL scale after treatment. It was found that a statistically significant difference exists on all subscales as well as on the total scale of the scale (Table 5). When looking at arithmetic meanings ( $\bar{x}$ ) we see that patients with early onset vocal rehabilitation have better achievements on the HNQOL scale than patients who started with late vocal rehabilitation.

**Table 5:** HNQOL, after vocal rehabilitation

		<b>Chewing/ swallowing food</b>	<b>Communication</b>	<b>Emotion</b>	<b>Pain</b>	<b>Total</b>
<b>Early vocal rehabilitation</b>	$\bar{x}$	98.06	97.59	99.51	98.98	98.38
	SD	6.64	11.88	6.78	4.74	3.99
<b>Late vocal rehabilitation</b>	$\bar{x}$	93.55	87.29	85.49	86.21	81.43
	SD	3.89	8.19	9.72	8.59	7.91
<b>Total</b>	$\bar{x}$	96.66	93.37	90.58	92.25	93.57
	SD	5.77	10.28	8.23	6.98	6.36
	F	4.90	3.33	3.74	3.81	5.20
	p	.032	.046	.032	.041	.027

$\bar{x}$  – arithmetic mean, SD – standard deviation, F – f test, p – statistical significance

By applying the t-test for dependent samples, a statistically significant improvement was found on all HNQOL scale scales following vocal rehabilitation (Table 6). A statistically significant difference in the HNQOL scale exists in the total score before and after treatment, which means that the overall functioning of patients in all investigated domains is better after treatment compared to the pre-treatment period.

**Table 6:** HNQOL, before and after vocal rehabilitation

VHI	Application Time	$\bar{x}$	SD	t	p
Chewing/swallowing food	Before treatment	53.91	26.45	-12.07	0,00
	After treatment	96.66	5.77		
Communication	Before treatment	5.75	8.64	-43.28	0,00
	After treatment	93.37	10.28		
Emotion	Before treatment	16.66	15.17	-31.94	0,00
	After treatment	90.58	8.23		
Pain	Before treatment	50.50	17.71	-15.96	0,00
	After treatment	92.25	6.98		
Total	Before treatment	52.50	17.71	-16.06	0,00
	After treatment	93.57	6.36		

$\bar{x}$  – arithmetic mean, SD – standard deviation, F – f test, p – statistical significance

## Discussions

The results of this study show that male respondents are more likely to suffer from malignant larynx tumors than women, the ratio is 94%: 6%, which is similar to the results of previous studies [12,13]. Laryngeal cancer is 4-5 times more common in males than in females [5].

The age of the subjects in this study ranged from 51 to 83 years, the average age of the respondents was  $62.6 \pm 7.32$ . The results in this study are comparable with the results of a large number of studies that suggest that laryngeal cancer occurs between 4 and 7 decades, most cases occurring in the sixth decade of life [14,15].

One of the main causes of laryngeal cancer is smoking. In this research study, all respondents (100%) were active smokers, with a long smoking experience. Other authors also highlight the negative effects of smoking when it comes to the formation of larynx carcasses [16,17], but they also talk about the combined effects of smoking and alcohol consumption [15].

Depending on the course of treatment (surgery, air therapy, radiotherapy), patients are involved in vocal rehabilitation. Early rehabilitation of speech and voice started from 3-4 weeks to two months after surgery, and is delayed four to six months and one year after surgery, that is, after radiotherapy or combined radio and air therapy has been completed.



Both started as soon as the patient's local and general condition allowed. According to the results of other researchers, vocal rehabilitation begins mainly two to four months after surgery, sometimes after six months [5,18].

The length of vocal rehabilitation ranged from one month to one year. In patients who successfully mastered electro-rarial speech vocal rehabilitation lasted briefly, they had three to five treatments, while in patients who successfully mastered the esophageal speech vocal rehabilitation lasted longer. According to the results of other researchers, continuous speech rehabilitation lasted from three to eight months [19], and mastering esophageal speech from six to twelve months [20,17].

Vocal rehabilitation should take as long as necessary to achieve optimum results.

Based on the results achieved on the HNQOL scale, all respondents had a problem in the described domains before vocal rehabilitation, especially when it comes to the supplements of communication and emotion, which had a negative impact on their quality of life, and in accordance with other studies [1,21,3,22,17,23]. Overcoming esophageal speech has led to the improvement of their physical and functional abilities [24]. Mastering the esophagous speech is connected with the physical and functional aspect, which reflects on their quality of life.

Prior to vocal rehabilitation, the physical appearance of the patient after total laryngectomy, or the presence of permanent tracheostomy, had a negative effect in this study on the emotional state of patients, which also deteriorated their quality of life, and was described in other studies [3,25,26,17]. After completed vocal rehabilitation, mastering one of the methods of speech influenced positive thinking to neglect the physical appearance, strengthen self-confidence and a sense of security, and improve the quality of life. Vocal rehabilitation in patients after total laryngectomy affects their emotional, social and psychological functioning, as well as a better quality of life [27,17].

It has been shown, based on more research that total laryngectomy can lead to problems with chewing/swallowing foods and loss of taste, which disrupts their quality of life. Before vocal rehabilitation, patients after total laryngectomy had moderate to more pronounced interference with food ingestion, which required longer chewing of taken food, and comparable with other studies [28,29]. After vocal rehabilitation, the subjects did not have any difficulties in this suppository [30].

One of the most common symptoms in cancer patients is pain, and is often the cause of depression, anxiety, despair, and a decline in quality of life [31,32]. Respondents mostly suffered from shoulder pain, which had a negative effect on their quality of life [33]. After vocal rehabilitation, there was a significant improvement, ie the respondents didn't show any pain, which had a positive impact on their quality of life.



Vocal rehabilitation is crucial in improving the quality of life and allows patients to return to normal life activities, but also to reduce the consequences of total laryngectomy [34]. Inclusion of patients after total laryngectomy in the process of vocal rehabilitation

And mastering speech is one of the important factors in improving the quality of life, it allows to return to normal life activities and positively influences the improvement of the emotional state of these patients [35].

## Conclusion

Vocal rehabilitation is of great importance in patients after total laryngectomy. By mastering one of the methods of speech, then overcoming feelings of shame for a different physical appearance after surgery, strengthening self-confidence and creating a sense of security, its positive effect is achieved. The quality of life is currently most often measured in various written questionnaires, by which we obtain information on how much the patient is able to perform everyday activities through which we observe his mental, physical and functional condition, but also how satisfied he is with the achieved level of functioning and control of the disease. In the future, improving the quality of life of laryngectomized patients should be an important goal that can be achieved through a multidisciplinary approach to treatment and vocal rehabilitation.

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## Conflict of Interest

The authors state to not have conflicts of interest in relation to this article.

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