Quality of life of laryngectomized patients in Serbia

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SUMMARY
Introduction/Objective Total laryngectomy is a very mutilating operation and it leads to drastic changes in life quality. The purpose of this study was to examine factors of importance to the laryngectomized patients’ quality of life and to evaluate characteristics of esophageal voice and speech.

Methods The study was conducted at the Clinic of Otorhinolaryngology and Maxillofacial Surgery, at the Clinical Center of Serbia (Belgrade, Serbia), during the period between March 2012–2015. The study included 223 patients diagnosed with laryngeal cancer, who underwent total laryngectomy. The total of 168 laryngectomized patients were provided with phoniatric rehabilitation.

Results The quality of life was significantly better for those laryngectomized patients who did undergo phoniatric rehabilitation. By means of intensive phoniatric rehabilitation the esophageal voice and speech was established in 86.3% of laryngectomized patients registered by objective acoustic analysis. Rehabilitated laryngectomy patients had a significantly lower presence of voice handicap sense (VHI: 19.57 ± 7.35) and expressed significantly lower symptoms of depression and anxiety (PHQ-9: 3.8 ± 4.2; GAD-7: 3.4 ± 4.2). Cronbach’s alpha coefficient was above 0.7 EORTC QLQ-C30 on three levels of Likert scales: the scale of physical and emotional functioning and fatigue; as well as EORTC QLQ-H&N43 questionnaire: the symptoms of head and neck pain, speech, swallowing and eating problems and body image.

Conclusion Significantly improving the quality of life of laryngectomized patients was achieved by a multidisciplinary rehabilitation. Phoniatric rehabilitation carried out in a planned and systematic way is the most efficient rehabilitation of laryngectomized patients.

Keywords: quality of life; total laryngectomy; esophageal voice and speech; phoniatric rehabilitation

INTRODUCTION
Quality of life currently represents one of the modern scientific concepts and it is considered the ideal of modern medicine. A holistic treatment of humans plays an important role in the realization of the concept of health-related quality of life.

In Serbian society, insufficient attention is devoted to the quality of life of laryngectomized patients. Total laryngectomy, as a very mutilative operation, leads to drastic changes in day to day life. This radical surgical intervention leaves the patients without larynx, saves their lives, but leaves them with significant repercussions to their functional and psychosocial domains [1]. Very important functions such as breathing, olfaction, speech, swallowing, as well as taste of these patients are permanently modified [2].

A multidisciplinary rehabilitation program is essential in order to improve life quality of laryngectomized patients. Phoniatric rehabilitation is the most important aspect of rehabilitation because it allows the restitution of verbal communication. Laryngectomized patients could use substitutional voice and speech in communication: esophageal voice and speech, vocal prosthesis or electrolarynx. The vocal rehabilitation and esophageal voice and speech establishment is certainly our method of choice; however, it also represents a huge health system savings.

Learning how to use esophageal voice and speech lasts for about four to six weeks, sometimes up to six months. In the esophageal voice, the source of energy is in esophagus, serving as a new reservoir of air, but significantly less than the physiological lungs. It begins with the establishment of ructus act, which is modulated into syllables and words. The sound sources represent the vibrations of neoglottis – pharyngeoesophageal segment.

Phoniatric team, which consists of phoniatricians, speech therapists, psychologists and nurses, is responsible for the successful rehabilitation of about 87% of laryngectomized patients who have mastered the esophageal voice and speech. Psychological rehabilitation enables resocialization, return to the family environment and social activities.

The contribution of this study was to finally establish the Association of Laryngectomized Patients of Serbia. The purpose of this study was to examine factors of importance to the quality of life of
Laryngectomized patients and to evaluate characteristics of esophageal voice and speech.

**METHODS**

The study was conducted at the Clinic of Otorhinolaryngology and Maxillofacial Surgery, at the Clinical Center of Serbia (CCS) in Belgrade, during the period from March 2012 to March 2015. The study included 223 patients who were diagnosed with laryngeal cancer and endured total laryngectomy at the Clinic of Otorhinolaryngology and Maxillofacial Surgery, who then underwent phoniatric rehabilitation that was conducted at the Phoniatric Department. In the study, patients were divided into two groups. The first group consisted of 168 laryngectomized patients who underwent all planned phases of phoniatric rehabilitation. The second group consisted of 55 laryngectomized patients who did not undergo the phoniatric rehabilitation because of their lack of motivation or inability to attend rehabilitation. The study was approved by the Ethics Committee of the Faculty of Medicine, University of Belgrade. All participants were provided with written participation consent for this research study.

The following procedure was performed to all patients: detailed case history, audiometry, phoniatric rehabilitation, psychological treatment, group rehabilitation, and multidimensional computer analysis of voice and speech. Phoniatric rehabilitation, in form of outpatient treatment or hospital treatment, was carried out by a phoniatric team, establishing an esophageal voice and speech.

Multidimensional computer analysis of voice and speech was recorded in a silent room with ambient noise under 50 decibels with Electret Condense Meeting Microphone CM 903, placed 30 centimeters in front of the patients mouth while entire signal was analyzed for 5 seconds. The commercial software package of Dr Speech (Tiger) was used, which includes Real Analysis, Vocal Assessment and Phonetogram. The signals used were the continuous vocal, the original sentence and the text, which were formulated in such a way that they phonetically and syntactically best represented the Serbian language. The analysis of the phoniatric results was carried out according to the proposals of the European protocol for the analysis and evaluation of the results of the rehabilitation of the voice [3].

Laryngectomized patients completed the following questionnaires: structured questionnaire of demographic and clinical parameters; EORTC QLQ-C30 and QLQ-H&N43; Voice Handicap Index-10 (VHI-10); Patient Health Questionnaire (PHQ-9) and Questionnaire of Generalized anxiety (GAD-7) [6].

The presence of depressed and generalized anxiety symptoms was measured by questionnaires Patient Health Questionnaire (PHQ-9) and Questionnaire of Generalized Anxiety (GAD-7) [7].

**Statistical analysis**

Pearson’s chi-squared test was used to determine the differences between respondents in relation to the dichotomous markers. The distinctions between the topical questionnaires of two groups of respondents were compared using the T-test. The internal consistency of the scale with three or more questions was tested by Cronbach’s alpha coefficient. Spearman’s p correlation coefficient was used to test the relationship between questionnaire scores.

All the scores on the questionnaires were analyzed individually, not as a set of questionnaires, which means that we only included adequately completed questionnaires. All analyses were processed in the PASW Statistics for Windows, Version 18.0 (SPSS Inc., Chicago, IL, USA) software package.

**RESULTS**

In our study, subjects were predominantly male (84.3%). The youngest laryngectomized patient was 28 while the oldest was 82 years old, meaning that the average age was 63.24 (8.1%) years, with most patients in their 60s.

Laryngectomy patients from this study were mostly retired (87.1%) either in the invalidity retirement due to malignancy or retirement age at the time of testing. A small number of laryngectomized patients were still actively working.

After examining the habits of laryngectomized patients before and after surgery, it was concluded a significant reduction in the percentage of smokers after total laryngectomy and slightly fewer number of alcohol consumers. Before surgery, 93.7% of patients smoked compared to 3.1% of patients postoperative. Before surgery, the percentage of alcohol consumers was 21.5% and 7.2% after surgery.

Most of laryngectomized patients were in stage III of malignant disease, which suggests the severity of the disease and justifies total laryngectomy; 81.6% of laryngectomized patients from this study had postoperative radiotherapy.

In this study, 23.8% of laryngectomized patients had hearing loss: mild hearing impairment 59% of respondents, moderate or severe hearing impairment 28%, and profound hearing impairment 13% of respondents.

48% of laryngectomized patients had some related chronic disease: 34.6% of patients had chronic respiratory disease, 37.4% had reflux disease, 28% had cardiovascular disease, and 23.4% of respondents had diabetes mellitus and hypothyroidism.

Out of the total 223, 168 patients (75.3%) underwent phoniatric rehabilitation. Among patients who lived outside Belgrade, 100/168 (59.9%) were hospitalized for the purpose of conducting phoniatric rehabilitation for two...
weeks at the Clinic of Otorhinolaryngology and Maxillofacial Surgery, CCS. According to the therapists, phoniatic rehabilitation was successful in 145 (86.3%) patients and 135 (80.4%) of respondents were satisfied with the results of their rehabilitation. Rehabilitation was more successful for those patients who did not have a hearing problem, who did not have associated chronic disease and who were not treated with postoperative radiotherapy. With intensive phoniatic rehabilitation, esophageal voice and speech were established in 86.3% of laryngectomized patients, which is registered by objective acoustic analysis (Table 1) (Figure 1).

**DISCUSSION**

The predominant number of laryngectomized male patients is noted in the literature, however the surge of female patients can be explained by growing number of women smokers and alcohol consumers, as well as their increased exposure to carcinogens. In our study, the ratio of female to male sex was 1:5. In their own research, Woodard and Berlin found the same ratio represented among sexes [8, 9]. The majority of our patients were in their sixties and seventies. The situation is similar in other studies [1, 2]. Laryngectomized patients in our study were mostly retired due to age, like in some other reports [10].

The quality of life of laryngectomized patients is severely affected in various degrees by different domains. Laryngectomized patients have a low level of social functioning and business capabilities, lower physical and emotional functioning, as well as global health and quality of life. Very influential domains of the quality of life are general functioning, as well as global health and quality of life. Patients is a very important social parameter.

Laryngectomized patients who were rehabilitated have a significantly better global health and quality of life as well as a remarkably higher level of physical, business, social, emotional and cognitive functioning compared to those who were not rehabilitated.

Laryngectomized patients who were exposed to phoniatic rehabilitation had a significantly lower level of general and specific symptoms such as fatigue, pain, loss of appetite, problems with speech and swallowing, coughing, problems with the sense of smell and taste, development and problems with socially contact and sexuality. Rehabeled laryngectomy patients had a significantly lower presence of voice handicap sense and expressed significantly lower symptoms of depression and anxiety.

The subjective experience of voice handicap of laryngectomized patients drastically impacts their quality of life. Laryngectomized patients in which phoniatic rehabilitation was conducted have significantly lower score values in the questionnaire VHI-10, which measures voice handicap index (Table 3).

Our study has confirmed the presence of high-level depression and anxiety symptoms in laryngectomized patients. Laryngectomized patients in which phoniatic rehabilitation was conducted have significantly lower scores in the questionnaire PHQ-9 and GAD-7, which indicates that depression and anxiety symptoms are less pronounced in the rehabilitated patients (Table 4).
Postoperative radiation has been carried out with 81.8% of our patients. In other studies, the percentage of irradiated patients ranges 27–85%, which depends on the number of patients involved in the study and the stages of malignant disease [11].

Phoniatric rehabilitation was successful in establishing esophageal voice and speech in 86.3% of our laryngectomized patients, which was registered by objective acoustic analysis. Esophageal voice has the most humane and similar to the normal, healthy human voice. Frequency, intensity, and voice restoration are significantly different from laryngeal voice. The rhythm of esophageal voice is slower. The range of this voice is very small. Esophageal voice is deep with very characteristic voice color. The intensity of this voice has been significantly reduced, but high-quality esophageal voice has satisfactory height for communication.

Multidimensional characteristics of esophageal voice and speech among the respondents who speak the Serbian language are the objective indicators of communication skills of the laryngectomized patients. The impact of vocal rehabilitation on quality of life and voice handicap in laryngectomized patients is noticed in another study [12].

The evidence from this study indicates that questionnaires EORTC QLQ-C30 and QLQ-H&N43 could be used to evaluate the quality of life of laryngectomized patients.

### Table 2. Scores QLQ-H&N43 questionnaire in relation with phoniatric rehabilitation (n = 223)

| Symptoms/problems                        | Phoniatric rehabilitation | M. Dif.* | t-test value | p-value |
|------------------------------------------|---------------------------|----------|-------------|---------|
|                                          | NO, n = 55                | YES, n = 168 |            |         |
|                                          | M  | SD | M  | SD |       |          |     |
| Fatigue                                  | 35.15 | 19.45   | 19.84 | 17.67 | 15.31 | 5.43 | < 0.001 |
| Nausea and vomiting                      | 9.39  | 12.73   | 4.76  | 9.68  | 4.63  | 2.83 | 0.005  |
| Pain                                     | 19.09 | 20.39   | 8.23  | 16.21 | 10.85 | 4.03 | < 0.001 |
| Dyspnea                                  | 11.73 | 18.49   | 5.99  | 19.12 | 5.74  | 1.93 | 0.055  |
| Insomnia                                 | 24.24 | 22.64   | 16.27 | 21.88 | 7.97  | 2.32 | 0.021  |
| Loss of appetite                         | 27.88 | 23.80   | 15.28 | 21.54 | 12.60 | 3.66 | < 0.001 |
| Constipation                             | 12.12 | 17.41   | 8.13  | 18.05 | 3.98  | 1.43 | 0.153  |
| Diarrhea                                 | 3.03  | 9.67    | 2.58  | 10.32 | 0.45  | 0.28 | 0.775  |
| Financial problems                       | 41.82 | 26.62   | 32.74 | 29.52 | 9.08  | 2.02 | 0.044  |
| H&N Neurological problems                | 12.73 | 19.76   | 10.12 | 19.22 | 2.60  | 0.86 | 0.387  |
| H&N Wound healing problem                | 4.85  | 11.86   | 5.16  | 18.95 | -0.31 | -0.11 | 0.909  |
| H&N Loss of weight                       | 20.00 | 21.85   | 12.50 | 23.55 | 7.50  | 2.08 | 0.038  |
| H&N Neck edema                           | 19.14 | 23.88   | 12.90 | 23.34 | 6.23  | 1.69 | 0.091  |
| H&N Cough                                | 43.03 | 28.45   | 27.38 | 23.78 | 15.64 | 3.64 | < 0.001 |
| H&N Mouth opening                        | 9.26  | 18.79   | 3.99  | 15.87 | 5.26  | 2.02 | 0.044  |
| H&N Social contact                       | 54.55 | 37.61   | 25.79 | 32.36 | 28.75 | 5.48 | < 0.001 |
| H&N Head and neck pain                   | 19.24 | 17.63   | 9.03  | 12.11 | 10.21 | 4.81 | < 0.001 |
| H&N Swallowing problems                  | 22.42 | 18.69   | 6.25  | 13.49 | 16.17 | 6.97 | < 0.001 |
| H&N Senses problems                      | 42.42 | 25.42   | 34.33 | 22.76 | 8.09  | 2.22 | 0.027  |
| H&N Speech problems                      | 75.39 | 31.99   | 51.27 | 24.77 | 24.12 | 5.81 | < 0.001 |
| H&N Eating problems                      | 23.03 | 18.70   | 8.88  | 16.65 | 14.15 | 5.30 | < 0.001 |
| H&N Sexuality                            | 60.00 | 37.21   | 49.31 | 31.66 | 10.69 | 2.079| 0.039  |
| H&N Teeth problems                       | 28.48 | 20.37   | 17.80 | 20.90 | 10.68 | 3.30 | 0.001  |
| H&N Dry mouth / Sticky saliva            | 40.12 | 23.69   | 27.64 | 19.25 | 12.47 | 3.90 | < 0.001 |
| H&N Body image                           | 33.74 | 22.93   | 23.41 | 23.14 | 10.32 | 2.87 | 0.004  |
| H&N Shoulder problem                     | 15.45 | 19.99   | 9.82  | 22.36 | 5.63  | 1.66 | 0.098  |
| H&N Skin problem                         | 12.12 | 12.52   | 8.33  | 11.39 | 3.78  | 2.08 | 0.038  |
| H&N Tension                              | 41.52 | 26.62   | 34.42 | 22.94 | 7.09  | 1.91 | 0.057  |

*Mean scores difference (M. Dif.)*

### Table 3. Scores VHI-10 questionnaire in relation with phoniatric rehabilitation (n = 223)

| Score          | Phoniatric rehabilitation | M. Dif.* | t-test value | p-value |
|----------------|---------------------------|----------|-------------|---------|
|                | NO, n = 55                | YES, n = 168 |          |         |
|                | M  | SD | M  | SD |       |          |     |
| VHI-10 Total   | 28.25 | 9.60   | 19.57 | 7.35  | 8.68  | 7.02 | < 0.001 |

*Mean scores difference (M. Dif.)*

### Table 4. Scores PHQ-9 and GAD-7 questionnaires in relation with phoniatric rehabilitation (n = 223)

| Score                  | Phoniatric rehabilitation | M. Dif.* | t-test value | p-value |
|------------------------|---------------------------|----------|-------------|---------|
|                        | NO, n = 55                | YES, n = 168 |          |         |
|                        | M  | SD | M  | SD |       |          |     |
| Depressive symptoms (PHQ-9) | 6.7 | 6.0   | 3.8  | 4.2  | 2.88  | 3.94 | < 0.001 |
| Anxiety symptoms (GAD-7) | 7.0 | 4.9   | 3.4  | 4.2  | 3.55  | 5.14 | < 0.001 |

*Mean scores difference (M. Dif.)*
The results of this study agree with the similar research, which have used EORTC QLQ-C30 and QLQ-H&N35 questionnaires with laryngectomized patients [13, 14]. Meanwhile, it was suggested that further research should be carried out, because there are no studies that have used QLQ-H&N43 questionnaire, in order to develop the norms for use of this questionnaire for the population in Serbia. The analysis of domain questionnaires EORTC QLQ-C30 has shown significant variations in the quality of life of laryngectomized patients. It has been observed that our patients have a high level of cognitive functioning, lower physical and emotional functioning, low level of social functioning and business ability, as well as overall health and quality of life. The continuous findings in different studies have shown changes in quality of life, especially in the domain of overall health [15, 16]. Some authors have reported lower functioning in the cognitive domain, as well as emotional and social functioning [17].

Our study documented that the general symptoms such as fatigue, insomnia, and appetite loss are dominant in laryngectomized patients, as noted by some other studies [18, 19]. The most expressive and specific symptoms of our patients were cough, dry mouth and sticky saliva, speech problems, social contact problems and sexual problems. These results are consistent with previous studies [20, 21]. In our study, there was no significant statistical difference in the assessment of quality of life between men and women. One of the previous studies has shown that women have lower emotional and social functioning [22]. Our patients had a high level of financial problems, as well as others [23]. Laryngectomized patients have significant psychological problems such as: difficult adaptation to the new situation, mood changes, lost confidence, feeling of loneliness, depression, anxiety disorders, posttraumatic stress syndrome [24–27]. Studies have shown that laryngectomized patients have more severe psychological problems than patients with other types of cancer and surgeries [28, 29, 30].

Our study has confirmed the high level of depression and anxiety symptoms in laryngectomized patients.

Our study is unique because it examined the quality of life of laryngectomized patients before and after phoniatric rehabilitation. The quality of life of laryngectomized patients in which was conducted phoniatric rehabilitation is significantly better than those who did not have phoniatric rehabilitation. Laryngectomized patients after phoniatric rehabilitation had significantly lower presence of voice handicap and less expressed symptoms of depression and anxiety.

CONCLUSION

Significantly improving the quality of life of laryngectomized patients was achieved by a multidisciplinary rehabilitation of patients as well as their families. Return to the family, profession, and social environment requires organized work of rehabilitation teams, which are not all sufficiently engaged. Phoniatric team has to be the moderator of rehabilitation of laryngectomized patients.

Rehabilitation of laryngectomized patients includes phoniatric rehabilitation, which must be carried out in a planned and systematic way in order to be the most efficient. Esophageal voice and speech are the most human form of communication for laryngectomized patients. Phoniatric rehabilitation success of 87% of patients testifies to the importance of learning the esophageal voice and speech, which was confirmed by this study.

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Квалитет живота ларингектомисаних болесника у Србији

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САЖЕТАК

Увод/Циљ
Тотална ларингектомија, као веома мутилантна операција, доводи до драстичних промена у квалитету живота. Циљ ове студије је да истражи факторе од значаја за квалитет живота ларингектомисаних болесника.

Методе
Истраживање је спроведено у Клиници за оториноларингологију и максилофацијалну хирургију Клиничког центра Србије у Београду, у периоду од марта 2012. до марта 2015. године. Испитивим је било обухваћено 223 болесника којима је због верификованог карцинома ларинкса учинена тотална ларингектомија и спроведена фонијатријска рехабилитација код 168 ларингектомисаних болесника.

Резултати
Квалитет живота ларингектомисаних болесника код којих је спроведена фонијатријска рехабилитација је значајно бољи од оних који нису имали фонијатријску рехабилитацију. Интензивном фонијатријском рехабилитацијом

је успостављен езофагусни глас и говор код 86,3% ларингектомисаних болесника, који је регистрован објективном акустичком анализом. Рехабилитовани ларингектомисани болесници имају значајно ниже присуство хендикепа због гласа (VHI: 19,57 ± 7,35) и значајно ниже изражене симптоме депресије и анксиозности (PHQ-9: 3,8 ± 4,2; GAD-7: 3,4 ± 4,2).

Закључак
Значајно побољшање квалитета живота ларингектомисаних болесника постиже се мултидисциплинарном рехабилитацијом. Фонијатријска рехабилитација, која се спроводи плански и систематично, представља најефикаснији начин рехабилитације ларингектомисаних болесника.

Кључне речи: квалитет живота; тотална ларингектомија; езофагусни глас и говор; фонијатријска рехабилитација.