

Original article

## The role of voice-related quality of life (V-RQOL) questionnaire in assessing quality of life in patients with vocal fold paralysis

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Primljen – Received: 24/11/2024

Prihvaćen – Accepted: 28/01/2025

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### Summary

**Introduction.** Vocal fold paralysis (VFP) is characterized by the immobility of one or both vocal folds, leading to impaired phonation, which significantly affects the patient's professional and social activities. The aim of this study was to examine the importance of the Voice-related Quality of Life (V-RQOL) questionnaire in assessing the quality of life (QL) of patients with VFP.

**Methods.** A retrospective study included 110 patients of both sexes, aged 18 to 70 years, diagnosed with VFP, treated between 2021 and 2023. The group with speech therapy (ST) included 80 patients, and the group without ST included 30 patients. The ear, nose and throat (ENT) and phoniatic examinations, as well as additional diagnostic tests, were performed. Patients were surveyed using the V-RQOL questionnaire to assess their quality of life.

**Results.** The highest frequency of VFP was observed in 39 (35.45%) patients with complications following thyroid surgery. Patients in the ST group showed a statistically significant ( $p < 0.001$ ) higher frequency of good (48.75%) and excellent (10%) QL compared to those in the non-ST group. The sensitivity of the total score of the V-RQOL questionnaire was 88.2%, correctly identifying ST patients.

**Conclusion.** The V-RQOL questionnaire is a reliable and valid measure for assessing the quality of life in patients with VFP.

**Key words:** vocal fold paralysis, V-RQOL questionnaire, speech therapy, voice-related quality of life

## Introduction

The larynx is a complex organ providing respiratory, phonatory, deglutition and reflex functions, as well as protection of the tracheobronchial tree. The control of laryngeal functions has phylogenetically evolved from simple sphincter-dilator reflexes to protect the lower airways to highly specialized phonation mechanisms [1–4].

Vocal folds paralysis (VFP) is characterized by the immobility of one or both vocal folds caused by dysfunction on the way from the cerebral cortex to the neuromuscular junction. VFP

continues to be a subject of interest and study due to its etiology, complex diagnostics, and especially due to long-term and complicated treatment. Among the most common etiological factors of VFP are diseases and surgery of the thyroid gland, surgical interventions on the chest, neurological causes, cancers of the lungs and esophagus, prolonged endotracheal intubation. Diagnostics and therapy of VFP requires a multidisciplinary approach, the solution of which involves, in addition to phoniatriest and speech therapist, audiologist, radiologist, pulmonologist, thoracic surgeon, psychologist, psychiatrist and others [5–9].

VFP has a great influence on the quality of life (QL) in patients with this disease. Achieving a compromise between respiratory and phonatory function is very delicate and certainly represents a significant social and emotional problem for patients, which can significantly impair the performance of daily life and professional activities [10–12].

The aim of the study was to examine the importance of Voice-related quality of life (V-RQOL) questionnaire in patients with VFP.

## Methods

The retrospective study included 110 patients of both sexes, aged 18–70 years with VFP who were diagnosed and treated in the Department of Ear, Nose and Throat from 2021 to 2023. The experimental group included 80 patients who underwent ST, and the control group included 30 patients without ST. The inclusion criteria werethat the patients were examined by a phoniatriest and a speech therapist, and the exclusion criteria were patients younger than 18 and older than 70 years.

The diagnosis was established on the history of the disease, ENT and phoniatriest examination, and additional diagnostic procedures: X-ray of the chest and esophagus, CT scans of the larynx during phonation and respiration, ultrasound and radioisotope examination of

the thyroid, abdominal ultrasound, neurological and audiological examination. Basic and objective phoniatriest procedures in the diagnosis and evaluation of VFP included endvideolaryngoscopy (EVLS) and stroboscopy.

The following parameters were examined: glottal occlusion before and after the end of ST, vocal folds position (intermediate or paramedian position in bilateral VFP and lateral in unilateral VFP). After ST, an assessment of glottis occlusion was made (complete or incomplete in the posterior part; “glottis gap”). The subjective assessment of complaints was made on the basis of a general generic V-RQOL questionnaire, where the emotional and functional domain of the QL of patients with VFP was examined in a survey, and the results were shown as a total score (TS). V-RQOL consisted of 10 statements in the first part and assessed voice quality in the second part [13–15].

The patient evaluates the statements marking them as 1- none, not a problem, 2- a small amount, 3- a moderate problem, 4- a lot, 5- problem is “as bad as it can be”. Also, the patient evaluates the voice quality as excellent/very good/good/fair/poor. V-RQOL is rated as excellent at 10–15 points, very good at 16–20, good at 21–25, fair at 26–30, poor at over 30 points. By providing information about family and professional relationships, the social-cultural environment and the necessity of direct verbal contact or the use of the telephone, the complexity of communication problems was analyzed.

The methods of descriptive statistics were used, and  $\chi^2$  test was used to test the dependability of category variables. Pearson’s parametric correlation was used to determine the degree of connection (correlation) of the observed characteristics. Binary logistic regression helped us to determine the predictive power of the questionnaire, that is, the TS score, in predicting ST in the patients. Statistical analysis was done using Statistical Package for the Social Sciences (SPSS) version 17.0 for Windows. Results were considered significant if the p value was  $< 0.05$ .

## Results

In the total sample of 110 patients, 32 (29.09%) were males, while 78 (70.91%) were females. The average age of patients with ST was 55.99 years (SD = 13.99), while the average age of patients without ST was 64.13 years (SD = 10.50). By sex, 16 (53.33%) patients without ST were females, whereas in the group of patients with ST, 62 (77.50%) patients belonged to the same sex. This difference is statistically significant ( $\chi^2 = 6.177$ ,  $df = 1$ ;  $p < 0.05$ ) (Table 1).

Age differences were also significant; more than half (53.33%) of patients without ST were older than 65, while patients younger than 65 (75%) were more likely to opt for ST. The difference between the groups was particularly pronounced among patients younger than 55 years ( $\chi^2 = 8.850$ ,  $df = 2$ ;  $p < 0.05$ ) (Table 1).

Patients with a higher level of education were more likely to opt for ST. Half (46.67%) of the patients in the group without ST had only primary education, whereas in the ST group, a higher proportion had secondary or higher education (46% and 20%, respectively). These differences are statistically significant ( $\chi^2 = 6.335$ ,  $df = 2$ ;  $p < 0.05$ ) (Table 1).

Nearly all patients in the ST group had dysphonia. On the other hand, symptoms such as dysphagia (18.75%) and dyspnea (12.5%) were reported in fewer number of patients. Differences in symptoms between the groups were not statistically significant ( $\chi^2 = 7.578$ ,  $df = 3$ ;  $p = 0.056$ ) (Table 1).

Regarding etiology, the highest percentage of patients in the total sample had a history of thyroid surgery (35.45%), followed by thyroid goiter (14.55%) and factors of unknown etiology (10%) (Table 1).

**Table 1.** Distribution of patients according to etiological factors

Etiology	Group without ST N (%)	Group with ST N (%)	Total N (%)
Thyroid surgery	5 (16.67%)	34 (42.50%)	39 (35.45%)
Thyroid goiter	1 (3.33%)	15 (18.75%)	16 (14.55%)
Idiopathic	0 (0.00%)	11 (13.75%)	11 (10.00%)
Viral infection	2 (6.67%)	6 (7.50%)	8 (7.27%)
Diabetes mellitus	3 (10.00%)	4 (5.00%)	7 (6.36%)
Post-op thyroid cancer	6 (20.00%)	0 (0.00%)	6 (5.45%)
Chest surgery	1 (3.33%)	4 (5.00%)	5 (4.55%)
Prolonged intubation	1 (3.33%)	4 (5.00%)	5 (4.55%)
Lung cancer	3 (10.00%)	0 (0.00%)	3 (2.73%)
Esophageal cancer	2 (6.67%)	0 (0.00%)	2 (1.82%)
Thyroid cancer	2 (6.67%)	0 (0.00%)	2 (1.82%)
Stroke (neurological)	1 (3.33%)	0 (0.00%)	1 (0.91%)
Chondrosarcoma	1 (3.33%)	0 (0.00%)	1 (0.91%)
Diabetes mellitus type 1	1 (3.33%)	0 (0.00%)	1 (0.91%)
Cardiomyopathy	0 (0.00%)	1 (1.25%)	1 (0.91%)
Neurological stroke	1 (3.33%)	0 (0.00%)	1 (0.91%)
Trachea resection	0 (0.00%)	1 (1.25%)	1 (0.91%)
<b>Total</b>	<b>30 (100.00%)</b>	<b>80 (100.00%)</b>	<b>110 (100.00%)</b>

ST - speech therapy

The average socio-emotional domain (SED) score in the ST group was 81.09 (SD = 14.03), while in the non-ST group it was significantly lower, 38.54 (SD = 14.21). The difference of 42.55 points between the two groups is statistically significant ( $t = -14.115$ ,  $df = 108$ ;  $p < 0.001$ ) (Table 2).

The average physical-functional domain (PFD) score in the non-ST group was 55.41 (SD = 10.21), whereas in the ST group it was significantly higher, 79.12 (SD = 13.20). The PFD score difference was 23.71 points, and this difference is statistically significant ( $t = -8.882$ ,  $df = 108$ ;  $p < 0.001$ ) (Table 2).

The average total score (TS) in the non-ST group was 48.40 (SD = 10.27), while in the ST group it was 79.80 (SD = 12.93), representing a difference of 31.40 points, which is statistically significant ( $t = -11.947$ ,  $df = 108$ ;  $p < 0.001$ ) (Table 2).

In the ST group, 48.75% of patients have a very good quality of life, and 10% have an excellent quality of life. In this group, 31.25% of patients have a good quality of life, and only 10% have a solid quality of life. The mentioned differences between both groups are statistically significant ( $p < 0.001$ ) (Table 3).

**Table 3.** Comparative data on quality of life by group

Quality of life	Group				Total	
	Group without ST		Group with ST		N	%
Solid	27	90.00	8	10.00	35	31.82
Good	3	10.00	25	31.25	28	25.45
Very good	0	0.00	39	48.75	39	35.45
Excellent	0	0.00	8	10.00	8	7.27
Total	30	100.00	80	100.00	110	100.00

$\chi^2 = 65.381$ ,  $df = 3$ ,  $p < 0.001$ , ST - speech therapy

**Table 4.** Comparable data on patients' quality of life by group

Predicted group of patients according to the TS	Group			
	Without ST		With ST	
Without ST	N	%	N	%
With ST	20	66.67	5	6.25
Total	10	33.33	75	93.75
	30	100.00	80	100.00
Sensitivity			Specificity	
0.882			0.800	

TS - total score, ST - speech therapy

**Table 2.** Correlation of age, socio-emotional and physical-functional domains and total score

Pearson Correlation		Age	SED	PFD	TS
Age	R	1.000	-0.214	-0.134	-0.193
	p		0.025	0.163	0.043
	N	110	110	110	110
SED	R	-0.214	1.000	0.869	0.962
	p	0.025		0.000	0.000
	N	110	110	110	110
PFD	R	-0.134	0.869	1.000	0.962
	p	0.163	0.000		0.000
	N	110	110	110	110
TS	r	-0.193	0.962	0.962	1.000
	p	0.043	0.000	0.000	
	N	110	110	110	110

$p < 0.05$ ; SED - socio-emotional domain, PFD - physical-functional, TS - total score

Binary logistic regression analysis revealed that the TS score has a high predictive power for ST. The sensitivity of the TS score is 0.882, correctly identifying 88.2% of ST patients. The specificity of the TS score is 0.800, correctly identifying 80% of non-ST patients (Table 4).

## Discussion

Complications such as VFP are rarely discussed. The recurrent laryngeal nerve, as a branch of the vagus nerve, may be damaged directly during the procedure by mechanical damage, traction, thermal damage, and its blood supply may also deteriorate as a result of swelling of the operated area immediately after the procedure. Similar causes are observed in thyroid surgery, where the function of the larynx and the risk of its damage have been thoroughly studied. Neuromonitoring has become a common procedure to avoid complications [13, 16–19].

Symptoms of unilateral VFP include hoarseness, impaired cough reflex or dysphagia. Many patients after thyroidectomy report voice disorders, despite the lack of changes in endoscopic examination and normal laryngeal function. These symptoms are assessed as a subjective disorder after thyroidectomy. The elderly thyroid cancer patients with comorbid diabetes, and pre- and postoperative laryngeal examination for thyroid surgery are listed as, very important factors for VFP occurrence in literature [20, 21]. In the literature, the risk of vagus nerve damage ranges from 2 to 4%; in the present study, it ultimately affected 3% of patients. Transient paresis occurred in 16% of patients, and due to the poor quality of voice in this group, these symptoms were not significant for patients. Paralysis of the laryngeal nerves is also observed after cervical spine surgery, other neck surgery, and thoracic surgery [22,23].

When differentiating the causes of voice disorders, psychogenic hoarseness associated with emotions should be taken into account. Neri et al. estimated that among patients with hoarseness after thyroidectomy 55.3% did not present somatic symptoms, but only psychogenic ones. Voice dysfunctions reported by patients in relation to quality of life before surgery may also have a significant psychogenic component. VFP, along with numerous other disorders, is one of the frequent causes

of vocal dysfunction. The control of phonatory functions starts from the cerebral cortex, depends on the respiratory musculature, the condition of the lungs, and the expiratory signal through the trachea and larynx, and the strength with which the vocal cords innervated by the recurrent nerve open and close the glottis [13, 18, 19, 24].

The leading symptoms of unilateral VFP are hoarseness and difficulty during swallowing, while bilateral VFP shows more difficulty in breathing due to the narrowing of the airway caused by the position of the vocal folds. The position of the vocal folds determines the degree of glottic occlusion, which is reflected in the respiratory function as well as the degree of hoarseness. Because of the polymorphic complaints, the therapeutic approaches for VFP are also different. The main goal of therapy should be the removal of etiological factors, improvement of respiratory and phonatory function, and improvement of patients' quality of life and social integration [25, 26].

Our research indicated that female patients with ST had a significantly higher prevalence (77.50%) compared to their counterparts in the control group (53.33%). Additionally, patients with ST exhibited a notable frequency among those under the age of 55. In the experimental group, a significantly higher percentage of patients with higher and secondary education was observed. The mentioned results are in accordance with the data from similar conducted researches [27, 28].

Our study showed that thyroid surgery was the leading etiological factor in the development of VFP. A group of American authors dealing with a similar issue cites different data where injuries to the neck and cervical spine are one of the leading etiological factors in the occurrence of neurogenic paralysis due to a greater number of traffic injuries (1,27–2,7%), thyroid surgery 2.1%, heart surgery 1.4%, esophageal cancers up to 30%, and prolonged endotracheal intubation 18%. Different representation of etiological factors is correlated

with economic development and social status of certain groups [22, 29–31].

The average SED score of patients with ST was significantly higher than in patients of the control group. We explain this result by the greater degree of motivation of the patients with ST for better and faster recovery. The average PFD score of patients with ST was also significantly higher than in patients in the control group. The leading factors influencing this result were related to the respondents' greater professional engagement, their need for social contact and more immediate forms of communication such as the use of the telephone [12, 15, 32, 33].

Comparing the age of the patients, it is very weakly or insignificantly correlated with the SED and TS scores. This could mean that patients older than 65 had significantly lower TS than patients younger than 55. All patients were tested on the basis of the V-RQOL questionnaire and we proved that the scores of SED, PFD and TS were in very strong positive correlations with each other. In the control group, as many as 90% of the patients had a fairly solid quality of life, and in the experimental group, 48.75% had a very good quality of life and 10% of the patients had an excellent quality of life.

We proved that the TS score had a high sensitivity and was an excellent predictor of quality of life in patients with VFP [25, 34, 35].

Early intervention and the use of the V-RQOL questionnaire are crucial in improving patients' quality of life, highlighting the importance of a multidisciplinary approach to VFP treatment. Further research is needed to refine therapeutic strategies.

## Conclusion

This study emphasizes the significant role of the V-RQOL in managing VFP. The findings show that female patients, younger individuals, and those with higher education are more likely to undergo ST. Thyroid surgery was the leading cause of VFP in our sample.

Patients who underwent ST reported significantly better quality of life, with higher scores in both socio-emotional (SED) and physical-functional (PFD) domains, compared to those who did not. The V-RQOL Total Score (TS) demonstrated strong predictive power, showing high sensitivity and specificity for treatment outcomes.

\*Abbreviations: VFP - Vocal fold paralysis, ST - Speech therapy, V-RQOL - Voice-Related Quality of Life, TS - Total Score, SED - Socio-Emotional domain, PFD - Physical-Functional domain

**Funding source.** The authors received no specific funding for this work.

**Ethical approval.** The Ethics Committee of the University Clinical Center of Republic of Srpska, Banja Luka, Republic of Srpska, Bosnia and Herzegovina, approved the study

(21.10.2024; No. 028-208-2) and informed consent was obtained from all individual respondents. The research was conducted according to the Declaration of Helsinki.

**Conflicts of interest.** The authors declare no conflict of interest.

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## Uloga upitnika kvaliteta života u vezi sa glasom (V-RQOL) u procjeni kvaliteta života kod pacijenata sa paralizom glasnica

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**Uvod.** Paraliza glasnih žica (PGŽ) karakteriše se nepokretnošću jedne ili obje glasne žice, što dovodi do oštećenja fonacije, a time i ozbiljno utiče na profesionalne i socijalne aktivnosti pacijenta. Cilj ove studije bio je da se ispita značaj upotrebe upitnika za kvalitet života vezan za glas (V-RQOL) u procjeni kvaliteta života (QL) pacijenata sa PGŽ.

**Metode.** Retrospektivna studija obuhvatila je 110 pacijenata, oba pola, uzrasta od 18 do 70 godina, sa dijagnozom PGŽ, koji su liječeni u periodu od 2021. do 2023. godine. Grupa pacijenata koja je primala logopedski tretman (LT) brojala je 80 pacijenata, dok je grupa bez LT imala 30 pacijenata. Sprovedeni su klinički pregledi uha, grla i nosa (ENT) i fonijatrijski pregledi, kao i dodatni dijagnostički testovi. Kvalitet života pacijenata procjenjivan je pomoću upitnika V-RQOL.

**Rezultati.** Najveća učestalost PGŽ zabilježena je kod 39 (35,45%) pacijenata sa komplikacijama nakon hirurških intervencija na štitnoj žlijezdi. Grupa pacijenata koja je primila LT pokazala je statistički značajno bolji kvalitet života (QL), sa 48,75% pacijenata koji su prijavili "dobar" i 10% pacijenata koji su prijavili "izvrstan" kvalitet života u poređenju sa grupom bez LT ( $p < 0,001$ ). Osjetljivost ukupnog rezultata upitnika V-RQOL bila je 88,2% u identifikaciji pacijenata koji su primili LT.

**Zaključak.** Upitnik V-RQOL je pouzdano i validno sredstvo za procjenu kvaliteta života pacijenata sa PGŽ.

**Ključne riječi:** paraliza glasnih žica, V-RQOL upitnik, logopedski tretman, kvalitet života vezan za glas