

Original Paper

Folia Phoniatria
et LogopaedicaFolia Phoniatr Logop 2011;63:122–128
DOI: [10.1159/000316416](https://doi.org/10.1159/000316416)

Published online: October 8, 2010

Voice Handicap and Health-Related Quality of Life after Treatment for Small Laryngeal Carcinoma

Helen Killguß^a Frank Gottwald^b Tino Haderlein^{a,c} Andreas Maier^{a,c}
Frank Rosanowski^a Heinrich Iro^b Georgios Psychogios^b Maria Schuster^aDepartments of ^aPhoniatrics and Pediatric Audiology and ^bOtorhinolaryngology – Head and Neck Surgery Clinics, University Hospital Erlangen, and ^cDepartment of Computer Science, University of Erlangen-Nuremberg, Erlangen, Germany

Key Words

Quality of life · Voice Handicap Index · Laryngeal carcinoma · Partial laryngectomy

Abstract

Treatment of small carcinoma of the larynx may lead to voice handicap and restricted quality of life. The relationship between the two is revealed. Sixty-five patients aged 62.1 ± 10.0 years rated their voice handicap and quality of life after treatment of T1 ($n = 35$) or T2 ($n = 30$) laryngeal carcinoma during regular out-patient examinations. For the self-assessment of the voice, the Voice Handicap Index (VHI) and the disease-independent Short Form-36 Health Survey (SF-36) questionnaires were used. Voice handicap (total score 38.9 ± 26.0) did not differ in the two tested groups, T1 and T2, and the data of SF-36 (physical score 43.0 ± 10.7 ; mental score 50.2 ± 9.1) showed significant differences for the mental score. Patients rated their voice handicap worse than healthy persons did after treatment of laryngeal carcinoma. VHI and SF-36 data were strongly correlated. Voice handicap is significantly related to the quality of life, especially affecting the mental domain. Thus, the rehabilitation of voice disorders should have a beneficial impact on quality of life.

Copyright © 2010 S. Karger AG, Basel

Background

According to the World Health Organization, health is not a one-dimensional issue, such as the absence of disease. Health is a state of complete physical, mental and social well-being [1]. Traditionally, the approach toward a disease was predominantly the observation of the patient's physical condition. In recent years, an alteration in the assessment of medical diagnosis and therapy has taken place. In addition to objective and biological factors, more and more individual psychosocial aspects reflecting the patient's strain are now also considered [2].

Nowadays, the health-related quality of life serves as a general parameter of the evaluation of subjective aspects. It integrates the relevant scopes of human experience and allows for comparisons of individual handicaps. The emphasis of further parameters which contribute to the evaluation of the patient's handicap depends on the individual diagnosis [3].

The participants of the current study suffered from small laryngeal cancer. Three basic functions of daily life are dependent on the function of the larynx: breathing, swallowing and verbal communication [4]. Regarding the psychosocial skills of our life, speech is of outstanding importance. Dysphonia can lead to psychological and

KARGER

Fax +41 61 306 12 34
E-Mail karger@karger.ch
www.karger.com© 2010 S. Karger AG, Basel
1021-7762/11/0633-0122\$38.00/0Accessible online at:
www.karger.com/fplDr. Maria Schuster
Department of Phoniatrics and Pediatric Audiology
University Hospital Erlangen, Bohlenplatz 21
DE-91054 Erlangen (Germany)
Tel. +49 9131 8527 872, Fax +49 9131 8539 272, E-Mail fri-schu@t-online.de

emotional problems as a direct consequence [5] and thus may diminish the quality of life. Therefore, the examination of social-communicative and psychological aspects should be included in the clinical evaluation after treatment of laryngeal cancer [6]. Standardized and well-evaluated questionnaires for specific and unspecific evaluation are now available. For the assessment of quality of life, the Short Form-36 Health Survey (SF-36) is the most commonly used standardized questionnaire. It is not specific for malignant diseases of the head and neck or voice-related problems [7]. For the self-assessment of voice-related problems, the Voice Handicap Index (VHI) [8] is often used. The patients are supposed to assess themselves regarding the intrapsychic, communicative and social relevance of the individual voice handicap.

The current study deals with the relationship between the quality of life and the voice handicap of patients treated by partial laryngectomy for small (T1 and T2) laryngeal carcinoma. Both aspects were evaluated by standardized questionnaires in a clinical study. The results of both questionnaires concerning the two tumor stages were compared.

Patients and Methods

Patients

During regular out-patient examinations, 65 patients (7 women, 58 men) who had suffered from laryngeal carcinoma were asked about their quality of life and voice handicap. The participants were between 34 and 83 years old; the average age was 62.1 ± 10.1 years (women: 56 ± 13.9 years, men: 61.7 ± 8.8 years). All patients gave their informed consent to participate in this study. The surgical treatment had been determined by size and localization of the tumor and performed with transoral, laser-assisted or transcervical methods (table 1). The period of time between the surgery and the data acquisition was 2.7 ± 2.6 years (range 0.1–12.1 years). The data were acquired at least 1 month after all treatments, including radiation therapy and/or chemotherapy, had been finished.

None of the patients were using a substitute voice, and none had a tracheostoma. At the time of the examination, none of the patients suffered from a relapse, cervical or other metastases.

Methods

The SF-36 questionnaire was used to evaluate the health-related quality of life. It represents an internationally applied, standardized questionnaire which has been proven disease-unspecific in routine clinical diagnostics. It consists of 8 subscales with a total of 36 questions. These are classified in the physical and mental component summary scales, PCS and MCS.

In order to evaluate the mental and physical cumulative values, a computerized evaluation program was used which enables the computation of a numerical value between 0 (worst condition) and 100 (best condition) [7].

Table 1. Description and therapy of 65 patients who had suffered from laryngeal carcinoma

	T1 (n = 35)	T2 (n = 30)
<i>Description</i>		
Supraglottic	2	13
Glottic	31	15
Subglottic	2	2
Bilateral	2	6
Unilateral	33	24
<i>Therapy</i>		
Surgery only	30	14
Surgery and radiation	4	7
Surgery and radiochemotherapy	1	7
Radiochemotherapy only	0	2

To examine the intrapsychic, communicative and social meaning of a voice handicap, Jacobson et al. [8] developed the VHI in the USA in 1997. It was later translated into German [9] and is also evaluated in some other European languages [10]. The questionnaire consists of 30 items, which are divided into three subscales (physical, functional and emotional). Each of these subscales contains 10 items. The maximum score is 120, indicating a severe voice handicap.

Statistical Analysis

The evaluation of the questionnaires was exclusively carried out with forms that had been filled out entirely. The statistical evaluation was executed with the use of SPSS, Version 16.0. Normal distribution was tested with the Kolmogorov-Smirnov test. Spearman's rank correlation coefficient and the Mann-Whitney test were used to examine the relationship between scores of quality of life and voice handicap. For more detailed results, the correlations were also computed separately for the two tumor stages, T1 and T2.

Results

The SF-36 physical component summary score varies from 17.4 to 59.4. The SF-36 mental component summary score contains data from 26.2 to 67.9. Detailed results of the SF-36 are given in figure 1b and c. Means, standard deviations and medians for T1 and T2 laryngeal cancer are given in table 3. Considering the different tumor stages in detail, T1 tumor patients rated their physical and mental situation better than the group of T2 tumor patients, with significant differences for the mental component summary score (physical component summary score T1: 45.7 ± 8.7 , T2: 39.8 ± 12.0 ; mental component summary score T1: 52.9 ± 8.3 , T2: 47.0 ± 9.0).

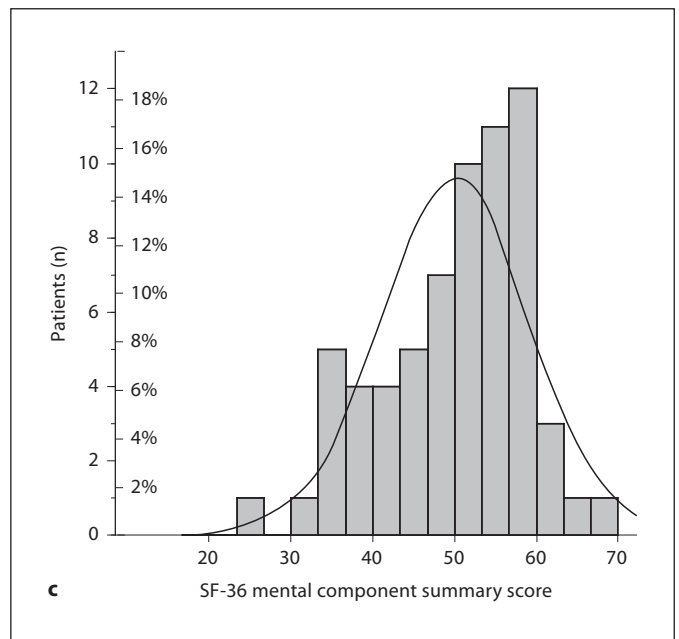
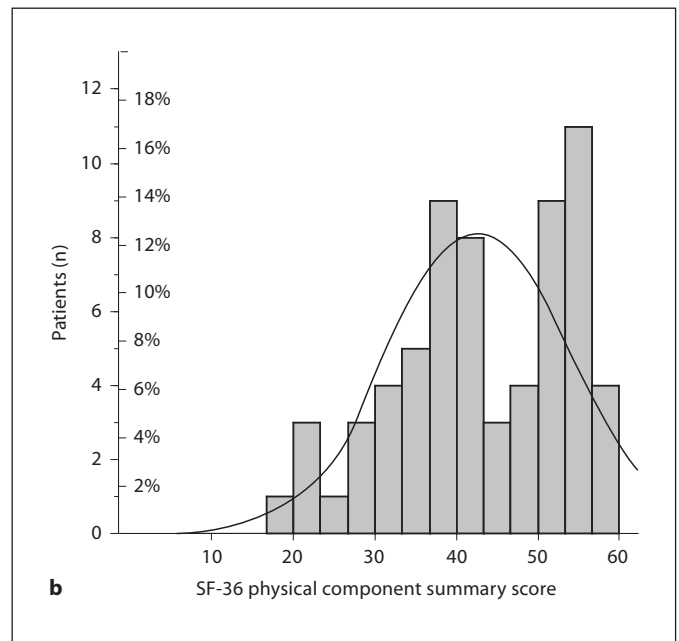
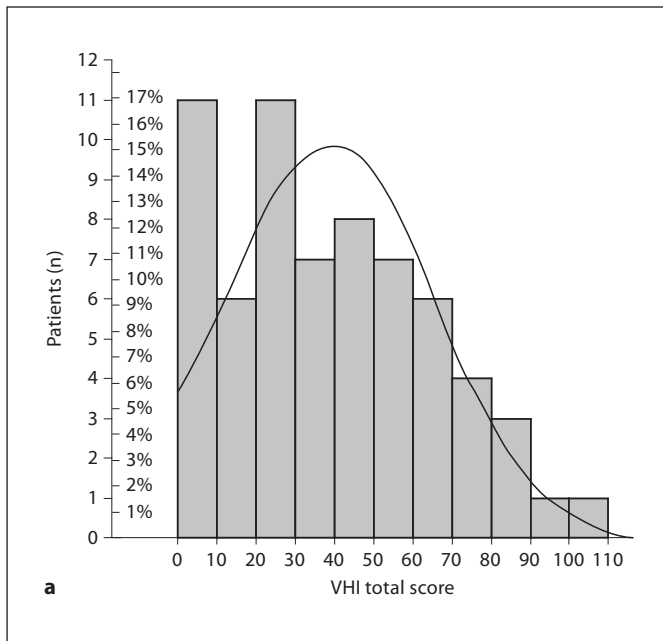


Fig. 1. a Distribution of the VHI total score results for 65 patients who had suffered laryngeal cancer T1 and T2. **b** Distribution of the physical component score results (SF-36) for 65 patients who had suffered laryngeal cancer T1 and T2. **c** Distribution of the mental component score results (SF-36) for 65 patients who had suffered laryngeal cancer T1 and T2.

The distribution of VHI data is shown in figure 1a; it is normally distributed. The mean score of VHI amounts to 38.9 ± 26.0 . The minimal value was 0, and the maximum value was 100 on a scale where 120 represent the maximum handicap. The VHI total results and subscale results regarding T1 and T2 patients separately are shown in table 2. There was no significant difference in the self-assessment of the VHI total score between patients who

had a T1 and those who had a T2 laryngeal carcinoma. The aspects represented by the physical subscale were perceived as the most restricting.

Figure 2 shows the relationship between the subscales of the SF-36 and the VHI total score. For a more detailed overview, figure 3 demonstrates the relationship between the SF-36 subscales and the VHI main score, considering the different tumor stages.

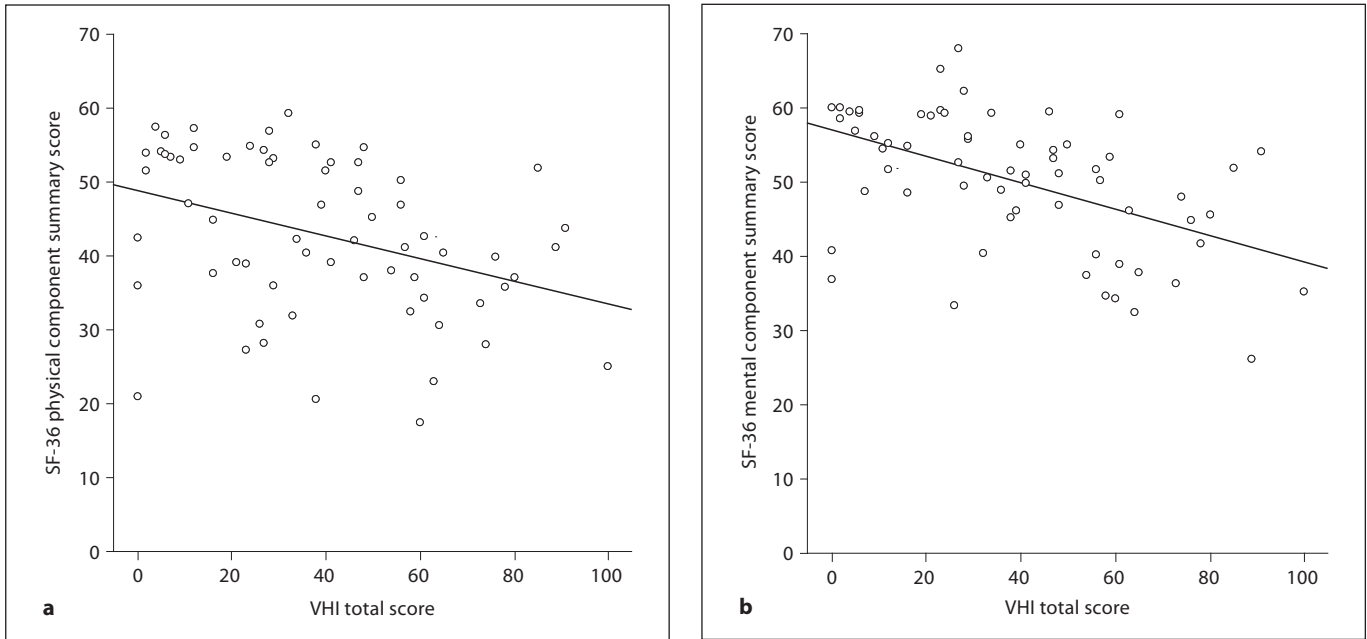


Fig. 2. a Correlation between VHI total score and SF-36 physical component summary score. **b** Correlation between VHI total score and SF-36 mental component summary score.

Table 2. Mean and standard deviation of the VHI subscales and VHI total for 65 patients who had suffered from T1 or T2 laryngeal carcinoma

VHI scale	T1 + T2 group score	T1 group score	T2 group score
Patients, n	65	35	30
Physical subscale	14.1 ± 8.3	14.9 ± 10.2	14.5 ± 9.3
Functional subscale	12.5 ± 8.5	13.0 ± 8.1	12.8 ± 8.2
Emotional subscale	12.2 ± 10.3	11.2 ± 9.6	11.7 ± 9.9
VHI total	38.9 ± 26.0	39.0 ± 26.7	38.8 ± 25.6

High VHI scores stand for high voice handicap.

Table 3. SF-36 physical and mental component summary score

	T1 + T2 group score	T1 group score	T2 group score
Patients, n	65	35	30
SF-36 physical component summary score			
Mean ± SD	43.0 ± 10.7	45.7 ± 8.7	39.8 ± 12.0
Median	42.4	46.8	39.0
SF-36 mental component summary score			
Mean ± SD	50.2 ± 9.1	52.9 ± 8.3	47.0 ± 9.0
Median	51.7	54.6	48.7

High SF-36 scores stand for high quality of life.

Discussion

The current study investigates the relationship between quality of life and voice handicap of patients who had suffered from T1 or T2 laryngeal carcinoma. The study was restricted to patients with small carcinomas. In this way, confounding factors such as breathing through a tracheostoma or distant metastasis were omitted. All patients were treated in the same clinic and by the same standards. Results showed a strong correlation between

both aspects of self-perception. Differences between patients who had suffered from T1 laryngeal cancer and T2 laryngeal cancer were found.

Different therapy strategies such as primary surgery or radiation therapy were included, because differences in the patients' self-assessment had not been reported by Stoeckli et al. [11]. The study included regular out-patient examinations. To minimize the impact of the patients' relationship to the otorhinolaryngologist, questionnaires were filled out before the examination.

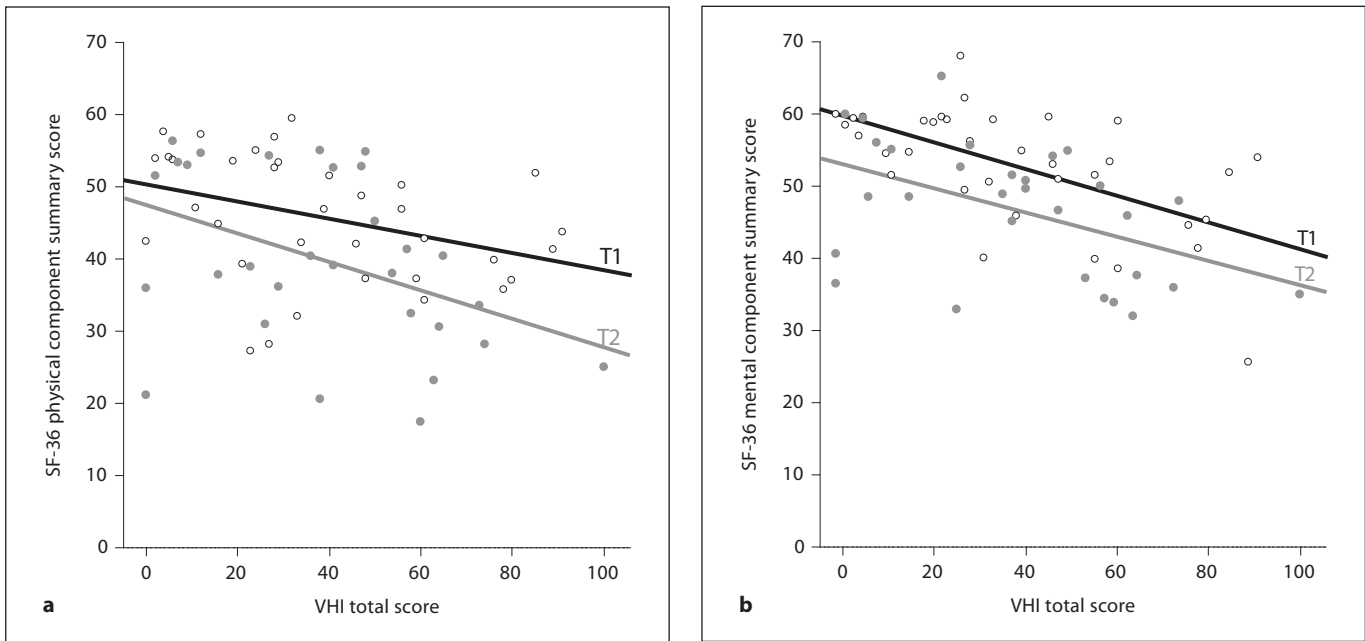


Fig. 3. a Correlation between VHI total score and SF-36 physical component summary score considering T1 and T2. **b** Correlation between VHI total score and SF-36 mental component summary score considering T1 and T2.

Table 4. Correlation of Spearman's ρ of the SF-36 and VHI questionnaires

	VHI scores (n = 65)			
	total	physical	functional	emotional
SF-36 physical component summary score				
ρ	-0.400	-0.449	-0.312	-0.398
p	0.001	<0.001	0.011	0.001
SF-36 mental component summary score				
ρ	-0.533	-0.439	-0.467	-0.592
p	<0.001	<0.001	<0.001	<0.001

p < 0.05 (significant correlation); p < 0.01 (highly significant correlation).

Quality of life is both subjective, including the patient's point of view, and multidimensional, covering a broad spectrum of aspects of the patient's life [12]. In order to assess quality of life, the SF-36 – a well-defined, standardized but not disease-specific questionnaire – was used. It allows to determine the relationship of overall quality of life and disease-specific aspects such as the voice handicap.

Table 5. Correlation of Spearman's ρ of the VHI and SF-36 questionnaires for patients who had suffered from T1 and T2 laryngeal carcinoma

	VHI group scores	
	T1 (n = 35)	T2 (n = 30)
SF-36 physical component summary score		
ρ	-0.452	-0.379
p	0.006	0.039
SF-36 mental component summary score		
ρ	-0.601	-0.492
p	<0.001	0.006

For disease-specific aspects of self-experience, the VHI questionnaire was added. The VHI is standardized for European languages [10]. It is used for both individual and group-specific analysis of the self-assessment of dysphonia. It also allows for comparisons with nonmalignant voice disorders [13].

The number of patients in the study (n = 65) was similar to other studies, and it was adequate for the statistical assessment of quality of life and voice handicap. Both questionnaires showed a wide range of scores. Data of

patients who had suffered from T1 and T2 laryngeal carcinoma varied slightly, allowing for comparisons of the SF-36 and VHI between these tumor stages.

SF-36

Differences were found between patients who had T1 laryngeal cancer and patients who had T2 laryngeal cancer. Comparing therapy procedures in the two groups, more extensive surgery and radiation therapy may have led to a lower quality of life with effects on mental health (tables 1, 3). In contrast to the German representative population aged 61–70 years for normative comparison [7], a lot of the patients who had suffered T2 carcinoma showed remarkably low scores: 12 of 30 patients (40%) for PCS and 17 of 30 patients (56.7%) for MCS in reference to the 25th percentile. In the T1 group, fewer patients than expected had low scores in reference to the 25th percentile: 5 of 35 (14.3%) for PCS and 9 of 35 (25.7%) for MCS, revealing an impact of the tumor extension on quality of life.

There are only a few papers regarding SF-36 scoring in patients treated for early laryngeal cancer. In a Lithuanian study reported by Siupsinskiene et al. [14], the results of quality of life were close to ours; however, the overall scores were higher in the mental and in the physical component summary score (PCS score: 58.5, MCS score: 65.4). This could be due to the fact that in this study more patients with T1 tumors were included (T1 n = 30, T2 n = 16) who also showed better results in our study. The data for the T1 or T2 laryngeal cancer groups were not shown separately in the Lithuanian study.

VHI

There was no difference in VHI scores between T1 and T2 laryngeal carcinoma patients. In other studies, a clear relationship between tumor size and handicap was also not found [15–17]. The VHI scores reported by Weigelt et al. [13] for nonmalignant voice disorders differed only slightly from the VHI total score and the three subscales of our study (VHI total score in benign organic dysphonia: 37.0 ± 23.5 ; VHI total in our study: 38.9 ± 26.0).

Grässel et al. [18] published a graduation of the VHI total score results for German-speaking patients. The VHI total score intervals (0; 11), (12; 28), (29; 56), and (57; 120) are converted to the labels ‘certainly inconspicuous’ (grade 0), ‘rather inconspicuous’ (grade 1), ‘rather conspicuous’ (grade 2) and ‘certainly conspicuous’ (grade 3). The scores for healthy persons were lower than the total score of patients having T1 and T2 laryngeal cancer, though 11 patients had VHI total scores within a normal

range (grade 0). The majority of participants had scores according to grade 2. On average, patients with partial laryngectomy assessed their voice handicap higher than healthy persons but not considerably higher than patients with voice disorders due to benign organic alterations of the larynx [13, 18]. In our study the VHI scores of the T1 and T2 patient groups were close (table 2), so the tumor stage did not have a major influence on the self-assessment of voice handicap.

SF-36 versus VHI

Both questionnaires measure different aspects of how patients experience the disease. Nevertheless, even though the VHI emphasizes only voice handicap, the test results show a close relationship with those of the SF-36. The highest correlation can be measured between the SF-36 mental component summary score and the emotional subscale of the VHI ($\rho = -0.59$; $p < 0.001$). This result reveals a clear coherence between positive self-assessment of voice and good mental health. The SF-36 mental component summary score shows a significant correlation with the VHI total score and also with two other subscales of the VHI, the functional and physical subscales.

The physical component summary score correlates with the VHI total score and all the three subscales. Concerning the physical and functional subscales of the VHI, we assume a relationship between general physical well-being and voice handicap, as shown previously by Schuster et al. [19] for patients who had undergone total laryngectomy. As published by Krischke et al. [20], dysphonic patients of benign etiology also suffer from different physical complaints depending on age and gender. Assuming a similar effect in the patients of our study, we expected an effect on the PCS. However, this could only be found for patients who had suffered T2 carcinoma, although both groups showed similar voice handicap scores.

The study was restricted to T1 and T2 carcinomas of the larynx, because the surgical treatment did not differ as much as it often does for later stages. However, the impact of possible confounding factors such as adjuvant radiation therapy and/or chemotherapy could not be analyzed due to the restricted number of patients. The different correlation results for T1 and T2 carcinoma might be due to these confounding factors.

Considering the strong correlation between both questionnaires, we assumed that the treatment of dysphonia and the decrease of voice handicap would enhance the quality of life in the physical and mental domain for patients with a small laryngeal carcinoma. In

order to prove this coherence, a long-term study would be useful. As the most important reference for the self-assessment of the voice, the quality of the voice will be included in further studies.

Conclusion

Voice handicap significantly relates to the health-related quality of life. This especially affects the mental domain of life in patients with a small carcinoma of the larynx as measured by the SF-36 questionnaire. The data also show significant differences for the mental component summary score between T1 and T2 patients. Patients with stage T1 laryngeal carcinoma had higher

scores in mental quality of life. Voice handicap scores of T1 and T2 patients are similar in our study.

Although there is a significant correlation between the two questionnaires, neither of them can be omitted because they cover different domains of self-assessment. Hence, the overall diagnostic assessment of patients who were treated for a small carcinoma of the larynx should include methods to evaluate both the self-experienced voice handicap and quality of life.

Acknowledgment

This work was supported by the Deutsche Krebshilfe (German Cancer Aid, grant No. 107873).

References

- World Health Organization: Strengthening mental health promotion. Geneva, WHO, 2007, Fact Sheet No. 220.
- Biesinger E, Iro H: HNO Praxis heute: Funktionsstörungen und funktionelle Störungen. Berlin, Springer 2004, vol 24, pp 40–49.
- Schuster M, Lohscheller J, Kummer P, Hoppe U, Eysholdt U, Rosanowski F: Quality of life in laryngectomees after prosthetic voice restoration. *Folia Phoniatr Logop* 2003;55:211–219.
- Singer S, Danker H, Bloching M, Kluge A, Schwenke J, Oeken J, Fuchs M, Schwarz R: Stigmatisierungsgefühle nach Kehlkopfentfernung. *Psychother Psychosom Med Psychol* 2007;57:328–333.
- Krischke S, Weigelt S, Hoppe U, Köllner V, Klotz M, Eysholdt U, Rosanowski F: Quality of life in dysphonic patients. *J Voice* 2005;19:132–137.
- Dejonckere PH, Bradley P, Clemente P, Cornut G, Crevier-Buchman L, Friedrich G, Van De Heyning P, Remacle M, Woisard V, Committee on Phoniatics of the European Laryngological Society (ELS): A basic protocol for functional assessment of voice pathology, especially for investigating the efficacy of (phonosurgical) treatments and evaluating new assessment techniques. Guideline elaborated by the Committee on Phoniatics of the European Laryngological Society (ELS). *Eur Arch Otorhinolaryngol* 2001;258:77–82.
- Bullinger M, Kirchberger I: SF-36. Fragebogen zum Gesundheitszustand. Göttingen, Hogrefe, 1998.
- Jacobson BH, Johnson A, Grywalski C, Silbergleit A, Jacobson G, Benninger MS, Newman CW: The voice handicap index (VHI): development and validation. *Am J Speech Lang Pathol* 1997;6:66–70.
- Nawka T, Wiesmann U, Gonnermann U: Validierung des Voice Handicap Index (VHI) in der deutschen Fassung. *HNO* 2003;51:921–930.
- Verdonck-de Leeuw IM, Kuik DJ, De Bodt M, Guimaraes I, Holmberg E-B, Nawka T, Rosen CA, Schindler A, Whurr R, Woisard V: Validation of the voice handicap index by assessing equivalence of European translations. *Folia Phoniatr Logop* 2008;60:173–178.
- Stoeckli SJ, Guidicelli M, Schneider A, Huber A, Schmid S: Quality of life after treatment for early laryngeal carcinoma. *Eur Arch Otorhinolaryngol* 2001;258:96–99.
- De Boer MF, McCormick LK, Pruynt JFA, Ryckman RM, van de Borne BW: Physical and psychosocial correlates of head and neck cancer: a review of the literature. *Otolaryngol Head Neck Surg* 1999;120:427–436.
- Weigelt S, Krischke S, Klotz M, Hoppe U, Köllner V, Eysholdt U, Rosanowski F: Voice Handicap Index: Instrument zur Bestimmung der subjektiven Beeinträchtigung durch organische und funktionelle Dysphonien. *HNO* 2004, DOI: [10.1007/00106-003-1039-z](https://doi.org/10.1007/00106-003-1039-z).
- Siupsinskiene N, Vaitkus S, Greblauskaite M, Engelmanaitė L, Sumskiene J: Quality of life and voice in patients treated for early laryngeal cancer. *Medicina (Kaunas)* 2008;44:288–295.
- Gotay CC, Moore TD: Assessing quality of life in head and neck cancer. *Qual Life Res* 1992;1:5–17.
- Lansky SB, List MA, Ritter-Sterr C, Logemann J, Pecos K: Quality of life in head and neck cancer survivors. *Proc Annu Meet Am Soc Clin Oncol* 1989;8:A656.
- McDonough EM, Boyd JH, Varvares MA, Maves MD: Relationship between psychological status and compliance in a sample of patients treated for cancer of the head and neck. *Head Neck* 1996;18:269–276.
- Grässel E, Hoppe U, Rosanowski F: Graduierung des Voice-Handicap-Index. *HNO* 2008;56:1221–1228.
- Schuster M, Toy H, Lohscheller J, Eysholdt U, Rosanowski F: Quality of life and voice handicap of laryngectomees using tracheoesophageal substitute voice (in German). *Laryngorhinootologie* 2005;84:101–107.
- Krischke S, Hoppe U, Eysholdt U, Köllner V, Rosanowski F: Physical complaints in dysphonic patients. *HNO* 2005;53:78–83.