Voice-related Quality of Life in Laryngectomees: 
Assessment Using the VHI and V-RQOL Symptom Scales

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Summary: The primary purpose of this study was to investigate the effect of the voice impairment across the physical, emotional, and functional domains in patients using valved speech following total laryngectomy with the help of two symptom specific scales. The study design used was a cross-sectional cohort. The setting was the Head and Neck Oncology Unit of a tertiary referral centre. Subjects were 54 patients who had undergone total laryngectomy. Two voice-specific questionnaires, the Voice-Related Quality of Life (V-RQOL—short form) Measure, and the Voice Handicap Index (VHI—long form) were used. The main outcome measure was patient perception of the voice following total laryngectomy in response to specific questions correlated with sociodemographic/treatment factors. Responses were received from 40 males and 14 females (response rate of 85.7%) with a median age of 63.4 years (range: 37–84). The V-RQOL overall analysis showed that 3 patients (5.6%) scored “excellent,” 29 patients (53.7%) “fair to good,” 14 patients (25.9%) “poor to fair,” and 8 patients (14.8%) “poor.” Analysis of the VHI revealed that 20 patients (37.0%) had a minimal handicap, 20 patients (37.0%) a moderate handicap, and 14 patients (25.9%) had a serious voice handicap. The individual domain or subscale scores for the VHI revealed a mean (SD) functional score of 15.8 (7.7), a physical score of 13.6 (7.2), and finally an emotional score of 11.6 (8.9). Functional aspects of the voice were significantly affected by age, radiotherapy, and chemotherapy (Spearman rho, \( P = 0.01 \); Mann-Whitney, \( P = 0.04 \) and \( P = 0.01 \)). The physical aspects of the voice were significantly affected by age and chemotherapy (Spearman rho, \( P = 0.004 \); Mann-Whitney, \( P = 0.04 \)). Only age significantly affected the emotional aspects of the voice (Spearman rho, \( P = 0.002 \)). We found a strong correlation (Spearman rho, \( P < 0.001 \)) between the V-RQOL and VHI questionnaires. Our study revealed that the V-RQOL and VHI scores in our series of patients following voice restoration in laryngectomees were consistent with that reported in the literature. Only age, radiation, and chemotherapy were seen to influence the voice handicap scores.

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In addition, both symptom scales had good correlation between them and either one could be used with reliability in laryngectomees with a few modifications.

**Key Words:** Voice-related quality of life—Voice handicap index—Total laryngectomy.

### INTRODUCTION

Head and neck cancer strikes at some of the most basic human functions, including breathing, eating, verbal communication, and social interaction. Measures of function and quality of life (QOL) have become increasingly important endpoints as means of judging the overall effectiveness of treatment approaches and providing justification for added toxicities. Accordingly, there are several assessment methods ranging from subjective measures of the severity of vocal derangement, including perceptual judgments, to objective measures of voice parameters. Although these methods yield valuable data, they do not provide an insight into why patients with similar voice disorders experience different levels of handicap and disability.

One major initiative of contemporary research has been the development of patient-centered outcome measures. Several disease- or condition-specific patient questionnaires have been developed to examine voice-related QOL. These patient self-report symptom specific scales can provide valuable information about functional abilities, social and emotional domains, and related QOL issues.

Contemporary voice rehabilitation following total laryngectomy has become fairly advanced, and many patients have intelligible speech after appropriate rehabilitation with a speech and language therapist. However, laryngectomees are unique amongst patients with head and neck cancer because they have specific concerns, issues, and problems. This is even more typified in those using prosthetic speech. Validated long form voice-specific scales, such as the Voice Handicap Index (VHI), can be time consuming to complete and may arguably provide a degree of redundant information. In contrast, concise short form scales, such as the Voice-Related Quality of Life (V-RQOL) questionnaire, are highly attractive in the clinical environment on account of their brevity. Very few studies have looked at the usefulness of these scales in laryngectomees and no study has assessed the correlation between the two scales in the laryngectomy population.

The primary purpose of this study was to investigate the effect of the voice in patients using valved speech following a total laryngectomy on the different physical, emotional, and functional aspects of their lives. Secondary objectives were to determine the correlation between the two scales (VHI and V-RQOL) and to study sociodemographic (age, sex) and treatment-related factors predictive of voice outcomes. Specific treatment-related factors that were studies included the method of reconstruction and closure of the pharyngo-oesophageal segment (PES), whether or not the patient had undergone a neck dissection, previous radiotherapy and/or chemotherapy, and the occurrence of complications.

### METHODS

We identified 63 patients who had undergone total laryngectomy from the Royal Marsden Hospital speech and language therapy database. All patients were recurrence free and were using a Blom-Singer voice prosthesis during the period of this retrospective study. All 63 patients were sent the two symptom scales/questionnaires (VHI and V-RQOL) by mail with a personalized covering letter providing information about the survey along with a prepaid return envelope. The time taken from the inception of the study to its completion was 3 months. The study was approved by the local research and ethics committee.

The VHI is a self-administered long form patient report instrument that was developed to quantify the patient’s perception of disability due to vocal
dysfunction.\textsuperscript{2} It has been widely shown to have good test-retest reliability, construct validity and is sensitive for a wide variety of voice disorders.\textsuperscript{2,7,8} It consists of 30 statements on voice-related aspects in three subdomains measuring emotional, physical, and functional issues. Each patient responds according to the suitability or closeness of each item (ranging from 0 = none to 4 = always) to his situation. It is scored from 0 to 120 with the latter representing the maximum perceived voice disability. The VHI Overall score or O-score is then categorized as a “minimal amount of handicap” when the score is from 0 to 30, a “moderate amount of handicap” with a score between 31 and 60, and finally a “serious amount of handicap” when the score is between 61 and 120.\textsuperscript{2}

The V-RQOL questionnaire is a self-administered short form patient report instrument that measures the subjective burden elicited by a voice disorder. As with the VHI, the V-RQOL has been shown to have good reliability and validity for a range of voice disorders.\textsuperscript{9,10} It consists of only 10 statements on voice-related aspects across emotional, physical, and functional domains. Each patient responds according to the suitability or closeness of each item (ranging from 1 = not a problem to 5 = the problem is “as bad as it can be”) to his situation. The “V-score” or the overall score ranges from 10 (worst) to 100 (excellent).\textsuperscript{3}

Statistical analysis

Data were entered into a worksheet (Excel 05; Microsoft Corp, Washington D.C.) and statistical analysis was performed using the Statistical Package for Social Sciences 10.0 (Version III, SPSS Inc, Chicago, IL). The data obtained with each scale were formally compared. In addition, data from both scales were correlated with sociodemographic (age, sex), treatment-related variables as well as with each other using nonparametric tests Spearman rho and Mann-Whitney. A \( P \) value less than 0.05 was considered as significant.

RESULTS

Patients

We received 54 completed questionnaires from the initial cohort of 63 patients with a resultant response rate of 85.7%. Most of the questionnaires were received in the first week and all by the end of the third week. Responses were received from 40 males and 14 females with a median age of 63.4 years (range: 37–84). The sociodemographic and treatment details of the patients are shown in Table 1. Almost half of the patients had undergone a neck dissection and more than a quarter had had some form of plastic surgical reconstructive procedure. The majority had received prior postoperative radiotherapy. All patients were using the Blom-Singer prosthetic valve.

VHI scores

The mean (±standard deviation [SD]) overall score for the VHI scale was 40.9 (21.8). The individual domain or subscale scores revealed a mean (±SD) functional score of 15.8 (7.7), a physical score of 13.6 (7.2), and an emotional score of 11.6 (8.9). The overall VHI scores for the individual patients are shown in Table 2. Patients were divided almost evenly between the three categories with 20 patients each in the minimal and moderate groups and 14 patients in the severe group.

<table>
<thead>
<tr>
<th>TABLE 1. Sociodemographic and Treatment Details of the Study Patients</th>
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<tbody>
<tr>
<td><strong>Sex</strong></td>
</tr>
<tr>
<td>Male</td>
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<tr>
<td>Female</td>
</tr>
<tr>
<td>Chemotherapy</td>
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<tr>
<td>Neck dissection</td>
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<tr>
<td>Radiotherapy</td>
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<tr>
<td>Reconstruction</td>
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<tr>
<td>PES closure*</td>
</tr>
<tr>
<td>Circumferential</td>
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<tr>
<td>Horizontal</td>
</tr>
<tr>
<td>T-shaped</td>
</tr>
<tr>
<td>Vertical</td>
</tr>
<tr>
<td>Postoperative complications</td>
</tr>
<tr>
<td>Tracheoesophageal puncture†</td>
</tr>
<tr>
<td>Primary</td>
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<tr>
<td>Secondary</td>
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<tr>
<td>Valve–Blom-Singer</td>
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PE, pharyngoesophageal.
*Data on the PES closure were available for 47 patients.
†Data on the timing of the TO puncture were available for 52 patients.
V-RQOL scores
The mean (±SD) overall or “V” score for the V-RQOL scale was 62.5 (24.5). Further analysis of the “V-score” is shown in Table 3. No patient in our study scored 10 or “worst” possible V-score.

Comparison of VHI and V-RQOL scales
When the scores for the two questionnaires were compared (Figures 1 and 2), there was a strong correlation for the interpretations of both questionnaires as well as between the V-score of the V-RQOL and the O-score of the VHI (Spearman rho, both \( P < 0.001 \)).

We found no statistical correlation between the V-score for the V-RQOL scale and the sociodemographic and treatment variables. In contrast, within the individual domains of the VHI scale, there were a number of significant associations between the scores recorded and the sociodemographic and treatment-related factors (Table 4 and Figure 3). Functional aspects of the voice were significantly affected by age, radiotherapy, and chemotherapy (Spearman rho, \( P = 0.01 \); Mann-Whitney, \( P = 0.04 \) and \( P = 0.01 \)). The physical aspects of the voice were significantly affected by age and chemotherapy (Spearman rho, \( P = 0.004 \); Mann-Whitney, \( P = 0.04 \)). Only age significantly affected the emotional aspects of the voice (Spearman rho, \( P = 0.002 \)). In contrast, sex, neck dissection, surgical reconstruction, the occurrence of postoperative complications, the method of PES closure, primary or secondary puncture showed no significant correlation with the scores in the individual domains of the VHI scale.

DISCUSSION
This study examines the voice handicap as experienced by laryngectomees using valved speech in their physical, social, and functional aspects of everyday life. It is well accepted that tracheoesophageal (TO) speech is significantly better than other alaryngeal phonation techniques such as esophageal speech or the electrolarynx. However, TO speech is still regarded as perceptually inferior to normal speech. There is evidence of discrepancy between how clinicians and patients rate the effect of vocal dysfunction on QOL after laryngectomy, with a tendency for clinicians to overemphasize its impact. Therefore, we felt that it was important to determine patients’ perspective of their voice and its influence on the domains in two validated voice assessment instruments. Although, a number of voice-specific symptom scales exist, we chose the VHI (long form) and V-RQOL (short form) scales.
form) scales primarily on the grounds that they have been widely used as validated and reliable questionnaires. The VHI has been recommended by the European Laryngeal Society for use in dysphonic patients. The questionnaire was sent by mail in a self-administered fashion as we thought that it would preserve confidentiality, avoid bias, and be easy to administer in a standard manner, be cost-effective and allow the patients to complete it at their own convenience.

Despite the presence of two essentially the same voice questionnaires that needed to be completed, we were pleasantly surprised with the enthusiasm with which both scales were received as judged by the enclosed comments and the very high response rate could suggest against this being a hindrance. This also could be an indication of the perceived relevance of the subject.

Our study had a reasonable mix of male and female patients with rates in accordance with the current incidence trends. All patients in our study were using the Blom-Singer valve in line with departmental policy. As a result, no comparisons or inferences could be drawn with other valves. Although it is generally expected that experienced valve users may be better adjusted to voice-related effects on their QOL, we did find a significant influence of time since valve insertion and QOL scores. Nearly half of the subjects on the V-RQOL scale and a third of subjects on the VHI scale were satisfied with their voice-related QOL, although there were reasonably large inter-individual differences across both scales, which may have been due to the heterogeneity in the patient population. These relatively high rates of patient satisfaction may reflect the perceived success of valved speech, which is superior to other techniques of alaryngeal speech. However, these data could, in part, also be a reflection of effective multidisciplinary team management of these patients.

There have been few studies of the use of the VHI and V-RQOL scales in laryngectomees. The VHI and V-RQOL scores for patients in our study were consistent with other published data in the

<table>
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<tr>
<th>VHI Domain</th>
<th>Treatment Variable</th>
<th>Test</th>
<th>P Value</th>
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<tbody>
<tr>
<td>Functional</td>
<td>Age</td>
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</tr>
<tr>
<td></td>
<td>Radiotherapy</td>
<td>Mann-Whitney</td>
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<td></td>
<td>Chemotherapy</td>
<td>Mann-Whitney</td>
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<tr>
<td>Physical</td>
<td>Age</td>
<td>Spearman rho</td>
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<tr>
<td></td>
<td>Chemotherapy</td>
<td>Mann-Whitney</td>
<td>0.04</td>
</tr>
<tr>
<td>Emotional</td>
<td>Age</td>
<td>Spearman rho</td>
<td>0.002</td>
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FIGURE 2. Scatter-plot showing correlation between the V-score of the V-RQOL and the O-score of the VHI scales (y-axis: V-score of the V-RQOL and x-axis: O-score of VHI).

FIGURE 3. Box-plot showing correlation between the age and the interpretation of the VHI scale.
literature. However, it must be kept in mind that sociological and cultural differences can influence these results just as tumor site, stage, and different therapies. Age was found to be a significant predictor of voice outcomes with a higher voice handicap in the younger age group. This could be related to the impact of vocal dysfunction on the working and social life of younger patients. There were no statistically significant differences in the scores between women and men, although the scores for the former group were higher in all three domains. Such findings are at odds with data that we have generated using a new validated questionnaire designed specifically for use in laryngectomised patients. These data demonstrated that females were generally less satisfied with prosthetic speech using a Blom-Singer valve and this translated to poorer QOL values. This dissatisfaction was, at least in part, due to the low tone of prosthetic speech and is frequently identified as cause for discontent amongst female laryngectomees. The failure of either the VHI or V-RQOL to detect a gender difference in a relatively large group of laryngectomies suggests that in some areas they are relatively blunt tools and that more specific questionnaires may be needed for optimal evaluation of this group of patients.

In regard to treatment-related factors, only radiotherapy and chemotherapy were associated with a higher level of voice handicap in our patients. Possible reasons could be that these treatments are often used in patients with more advanced stage disease. Surgical details such as neck dissection, pharyngectomy, reconstruction were not seen to influence our voice-related scores. The reason for this is not entirely clear and deserves further attention.

In addition, radiotherapy can cause fibrosis or stiffening of the PES thereby reducing its vibratory properties. Interestingly, the VHI or V-RQOL scores were not influenced by any aspect of surgical management. In particular, there was no effect of neck dissection, the form of closure of the PES, the need for reconstruction or the occurrence of complications.

The long form VHI scale is more structured, comprehensive, and organized but more time consuming and may provide a degree of redundant information. On the other hand, the short form V-RQOL scale is brief, concise and yet correlates well with the VHI on all three domains. This suggests that both scales assess the same constellation of voice complaints. Short form scales like the V-RQOL are more attractive to the busy clinician. Long form scales like the VHI could prove more useful in the research setting where the greater detail offered may be more valuable. Although both scales give similar useful information about functional, physical, and emotional aspects of vocal disability in laryngectomy patients and are strongly correlated with each other, they do not have any statement pertaining to the tone of the voice, which is an important issue in laryngectomies. In addition, for the work-related statement, there is no option for laryngectomees who have retired from active work and this has an effect on the scoring of the two scales. Certainly, these two issues need to be addressed or incorporated in the content of the scales to enable their valid use in the laryngectomy population. Also, both scales are closed format and could, therefore, be considered a little restrictive as far as answer options are concerned because they do not offer any open questions to encourage suggestions or comments.

A significant shortcoming of this study is its retrospective nature. A longitudinal analysis is needed to evaluate specific alterations in vocal function within individual patients prospectively over time. This will effectively eliminate the effect of coping strategies and changing perceptions of the importance and influence of voice across time to the overall QOL. There is also an element of selection and survival bias that is inherently seen in any retrospective design study. In addition, we have not looked into the correlation of objective voice parameters and the patient perception of voice and it would be advisable to direct future research into this aspect.

CONCLUSION

This study found that the VHI and V-RQOL scores in our series of patients with voice restoration after total laryngectomy were consistent with that reported in the literature. The use of the voice prosthesis in laryngectomy patients has resulted in an improvement in the voice-related QOL.
providing better functional and social voice usage and a decrease in voice associated emotional conflicts in these patients.

Only age, radiation, and chemotherapy were seen to influence the voice handicap scores. Both types of assessments (VHI and V-RQOL) are simple, easy to use, and give robust and comparable measures about the voice in laryngectomees with a few exceptions. With a few modifications, they can serve as useful tools in monitoring and auditing the physical, functional, and emotional voice outcomes following total laryngectomy.

REFERENCES