

Functional status after total laryngectomy: cross-sectional survey of 79 laryngectomees using the Performance Status Scale for Head and Neck Cancer

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Abstract

Introduction: Total laryngectomy affects patients' post-operative speech and swallowing functions. We aimed to assess these outcomes.

Materials and methods: Patients' normalcy of diet, ability to eat in public and speech comprehensibility were assessed using the Performance Status Scale for Head and Neck Cancer, in a cross-sectional survey of disease-free laryngectomees.

Results and analysis: Seventy-nine laryngectomees (72 men and seven women), with a mean age of 64 years (range 37 to 96), were included. Mean scores were 81.6 (standard deviation 29.2) for normalcy of diet, 77.8 (standard deviation 30.2) for eating in public and 65.2 (standard deviation 23.5) for speech. Normalcy of diet achieved higher scores within six months of laryngectomy and remained stable. There was a statistically significant difference between scores for the speech and public eating domains, comparing patients less and more than six months post-laryngectomy. This trend was maintained beyond 12 months.

Conclusions: In post-laryngectomy patients, Performance Status Scale for Head and Neck Cancer scores improved over time, especially those for the speech and public eating domains, reflecting increasing confidence in social interactions and familiarity with surgical voice restoration.

Key words: Larynx; Laryngeal Neoplasms; Laryngectomy; Speech; Swallowing; Outcome Assessment

Introduction

Total laryngectomy is known to have a significant impact on patients' speech and swallowing functions. Post-laryngectomy voice rehabilitation by primary or secondary tracheoesophageal valved speech has been the 'gold standard' for many decades now. Recent studies indicate that expert and lay listeners perceive tracheoesophageal speech to be superior to other methods of speech rehabilitation.^{1–3} Many factors can have an impact on patients' swallowing function following pharyngeal repair, including scarring, neopharyngeal stenosis and the effect of adjuvant radiation therapy. Despite this, swallowing inventories identify a subjective satisfaction with swallowing.⁴

Health-related quality of life (QoL) studies abound in the head and neck oncological literature, but few studies have studied solely laryngectomees.^{5–7} In these studies, speech and swallowing outcomes have been primarily assessed using health-related QoL measures. These measures have been developed using classical test theory, provide

domain scores for populations and require benchmarks for clinical interpretation.⁸ However, many of these instruments have 'function' domains assessed purely from the patient's perspective.

Patients' functional status after treatment for head and neck cancer is not well reflected in health-related QoL studies, especially for laryngectomees.⁹ The aim of the current study was to prospectively assess the functional status of a substantial cohort of laryngectomees, using an instrument widely employed for this purpose. The Performance Status Scale for Head and Neck Cancer (PSS-HN) was designed by List *et al.* over a decade ago.¹⁰ It is a well established performance assessment tool, is easy to administer to patients, and has been developed especially for head and neck cancer patients.

Materials and methods

Ethical considerations

Use of the Performance Status Scale for Head and Neck Cancer has been an integral part of our practice

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since 1998. The current study involved analysis of existing data, including information obtained via a simple, clinician-administered questionnaire, and thus constituted an evaluation of our service provision. Ethical approval was therefore not required.

The instrument

The Performance Status Scale for Head and Neck Cancer is a three-item, clinician-rated, validated speech and eating outcomes measure developed by List *et al.*^{10,11} This questionnaire uses a proforma to enable streamlined acquisition of data. Its purpose is to evaluate the areas of dysfunction experienced by head and neck cancer sufferers. This instrument can also be used to monitor response to treatment. In addition, it can be used for patients with other diseases affecting the head and neck, such as trauma or neurological conditions.

The PSS-HN questionnaire involves clinician evaluation of the following domains: (1) eating in public; (2) comprehensibility of speech; and (3) normalcy of diet, a surrogate indicator of the patient's swallowing function (Table I). In each domain, a subscale lists varying levels of performance, forming a hierarchical continuum, with total incapacitation at one end of the spectrum and full or normal functioning at the other. Subscales are rated from zero to 100, with 100 representing normal function and lower scores representing poorer function.

The Performance Status Scale for Head and Neck Cancer questionnaire is simply scored, with no formal training required, and can thus be used easily by health professionals of different grades. On average, it can be completed within 10 minutes. Ratings are determined through use of an

unstructured interview format, ensuring that the different areas in the questionnaire has been covered.

Patients

We included in this observational study patients on our speech and language therapy database who had undergone total laryngectomy without flap reconstruction at The Newcastle Upon Tyne Hospitals National Health Service Trust, and who agreed to complete a Performance Status Scale for Head and Neck Cancer questionnaire with a speech and language therapist.

In our practice, patients undergoing uncomplicated laryngectomy are allowed to eat between the seventh and tenth post-operative days, and are fitted with a speech valve at approximately the same time, prior to discharge. The Performance Status Scale for Head and Neck Cancer questionnaire is usually completed prospectively when the patient attends the speech and language therapy services. The purpose of attendance can range from routine speech valve change to problems with granulation tissue around the valve. In this study, the PSS-HN questionnaire was ideally completed at the time of the first speech and language therapy visit. The timing of this first visit could however be affected by a number of factors, including length of hospital stay, post-operative complications, amount of support required for voice rehabilitation, need for further treatment and other patient factors. For instance, if the patient required post-operative radiotherapy, then the questionnaire was administered at least six weeks after completion of this.

We excluded from the study laryngectomees with post-operative complications (e.g. pharyngocutaneous

TABLE I

THE PERFORMANCE STATUS SCALE FOR HEAD AND NECK CANCER, WITH INCIDENCE OF RESPONSES IN CURRENT STUDY PATIENTS

Domain	Performance	Score	Frequency of response (%)
Eating in public	No restriction of place, food or companion (can eat out at any opportunity)	100	57.0
	No restriction of place, but restricts diet when in public (eats anywhere but limits diet to foods that are handled easily, e.g. liquids)	75	12.7
	Eats only in presence of selected persons in selected places	50	21.5
	Eats only at home in presence of selected persons	25	2.5
	Always eats alone	0	6.3
Comprehensibility of speech	Always understandable	100	13.9
	Understandable most of the time; occasional repetition necessary	75	48.1
	Usually understandable; face-to-face contact necessary	50	25.3
	Difficult to understand	25	10.1
Normalcy of diet	Never understandable; may use written communication	0	2.5
	Full diet with no restrictions	100	53.2
	Peanuts	90	20.3
	All meats	80	2.5
	Carrots & celery	70	1.3
	Dry bread & crackers	60	0
	Soft, chewable foods	50	7.6
	Soft foods requiring no chewing	40	6.3
	Puréed foods	30	1.3
	Warm liquids	20	1.3
	Cold liquids	10	0
Non-oral feeding (tube feeding etc)	0	5.1	

TABLE II
PERFORMANCE STATUS SCALE FOR HEAD AND NECK CANCER SCORES BY POST-LARYNGECTOMY TIME

Time* (mths)	Pts (n)	Normalcy of diet	Eating in public	Speech	Total score
<6	30	80.0 (31.6)	70.0 (33.1)	58.3 (24.9)	69.4 (20.8)
6–12	19	83.7 (27.9)	78.9 (29.2)	61.8 (25.5)	74.8 (22.0)
>12	30	81.8 (28.3)	85.0 (26.7)	74.2 (18.0)	80.3 (18.9)
All pts	79	81.6 (29.2)	77.8 (30.2)	65.2 (23.5)	74.9 (20.7)

Data represent mean scores (standard deviations) unless otherwise indicated. *Period between laryngectomy and first Scale administration. Mths = months; pts = patients

fistula) or delayed feeding, and those who did not have a speech valve inserted.

The Performance Status Scale for Head and Neck Cancer questionnaire was administered to all other laryngectomy patients.

We retrospectively reviewed patients' speech and language therapy case notes to identify their demographic and surgical details, use of adjuvant therapy, and Performance Status Scale for Head and Neck Cancer scores. Functional status, as measured by the PSS-HN questionnaire, was available for 79 patients. All hard copy data were entered into a spreadsheet (using Excel 97 software; Microsoft, Redmond, Washington, USA). The PSS-HN questionnaire was repeated in 46 patients to assess their stability of function over time.

Statistical analysis

We performed descriptive statistical tests to identify the central tendency and spread of data. Although the data points were ordinal, we felt confident using parametric measures of central tendency, as 79 patients had answered the questionnaire. Non-parametric tests were used to analyse the differences in scores between the functional domains. Analysis was performed using the Statistical Package for the Social Sciences version 15.0 software (SPSS Inc, Chicago, Illinois, USA). Differences with a *p* value of less than 0.05 were considered statistically significant.

Results and analysis

Seventy-nine Performance Status Scale for Head and Neck Cancer questionnaires were available for review; data were obtained from these questionnaires. The majority of patients were men (72/79; 91 per cent), with a mean age of 64 years (range 37 to 96). The seven women in the cohort had a mean age of 58 years (range 48 to 70). Forty-six patients had undergone a primary laryngectomy, and 33 were post-radiation salvage laryngectomees. Thirty-two patients had received adjuvant radiotherapy; 14 had received no radiotherapy.

Scoring frequencies for the three Performance Status Scale for Head and Neck Cancer domains are shown in Table I. Patients were divided into three groups based on the length of time elapsed between surgery and completion of the PSS-HN questionnaire: less than six months, six to 12 months and more than 12 months. Six months was chosen as the first cut-off time; by then, the vast majority of patients could be expected to have

recovered from the acute effects and complications of their operation, and adjuvant radiation, if given. It is well recognised that most patients recover their baseline quality of life by 12 months post-operatively, and this was the rationale behind the second cut-off point. The mean post-operative time point for PSS-HN questionnaire completion was 22.6 months, with a range of 1.2 to 219.5 months. Ten patients were administered the Scale questionnaire 60 months or more after their laryngectomy; these patients were existing laryngectomees on our records when the study commenced, were infrequent visitors to the speech and language therapy department, and had stable function.

The median score for both the 'normalcy of diet' and 'eating in public' domains was 100, indicating excellent function. The median score for the 'speech' domain was 75. Patients' mean scores were 81.6 (standard deviation (SD) 29.2) for 'normalcy of diet', 77.8 (SD 30.2) for 'eating in public' and 65.2 (SD 23.5) for 'speech'. Patients' mean scores and other descriptive data for the three post-operative time periods are shown in Table II. In the 'eating in public' and 'speech' domains, mean scores for each of the three time periods showed a trend towards higher scores as time elapsed. This trend was statistically significant for the 'speech' domain (*p* = 0.02; Kruskal–Wallis test). No statistically significant change was seen for the 'eating in public' or 'normalcy of diet' domains. When scores for patients less than and more than six months post-operative were compared, statistically significant differences were found for the 'speech' and 'eating in public' domains.

Repeated questionnaire observations were available for 46 patients beyond the six-month cut-off time, with a mean interval of 10.2 months (range 1.2 to 28.2 months) between the observations. These were treated as paired data, and the three domain scores were compared with earlier responses. There were no significant differences in the 'normalcy of diet' and 'eating in public' scores. However, 'speech' scores showed a statistically significant improvement over time (*p* = 0.04; Wilcoxon signed rank test).

No statistically significant score differences were observed, comparing patients who received combined treatment with those undergoing laryngectomy alone (Table III).

Discussion

It is well recognised that the health-related QoL of patients with head and neck cancer decreases

TABLE III
PERFORMANCE STATUS SCALE FOR HEAD AND NECK CANCER SCORES BY TREATMENT TYPE

Treatment	Pts (n)	Normalcy of diet	Eating in public	Speech	Total
Salvage TL*	33	79.8 (30.7)	81.1 (24.2)	65.2 (22.5)	75.4 (19.2)
TL+RT	32	79.4 (28.8)	71.1 (32.4)	63.3 (27.7)	71.3 (21.2)
TL alone	14	90.7 (26.4)	85.7 (36.3)	69.6 (14.5)	82.0 (22.4)

Data represent mean scores (standard deviations) unless otherwise indicated. *Following failed primary radiotherapy (RT). Pts = patients; TL = total laryngectomy

during treatment; however, several studies have demonstrated that it returns to baseline by 12 months post-operatively, despite persisting issues with function.^{12,13} Total laryngectomy has a permanent and significant impact on patients' speech and swallowing, and yet studies focusing on laryngectomees alone have confirmed that they enjoy good health-related QoL in the long term following treatment.^{6,7} Thus, issues of function appear to have a variable effect on health-related QoL. The measurement of performance status after treatment provides more information than that obtained from health-related QoL instruments, information which can help inform rehabilitation strategies and outcomes reporting, and thus in turn improve functional outcome. Pre-operative administration of the Performance Status Scale for Head and Neck Cancer provides useful descriptive information which may be helpful when counselling patients prior to total laryngectomy. Also, unlike health-related QoL questionnaires, which are validated to provide domain scores or global scores for a patient population, benchmarks need not be set in order to interpret PSS-HN questionnaire data.⁸

The specific strengths of the Performance Status Scale for Head and Neck Cancer make it particularly well suited for clinical and research use. The PSS-HN questionnaire is short and concise. It is ideal for repeated administration, and is applicable in post-laryngectomy patients as it has been specifically developed in a head and neck cancer population. Its instructions for use are straightforward, no formal training is necessary, and it can be easily and quickly administered by a health professional in the course of a clinic visit. The questionnaire domains show some association, but each predominantly assesses a unique function. The PSS-HN questionnaire also accurately describes, and discriminates between, functional differences not detected by QoL questionnaires.

This study included the largest series to date in which the Performance Status Scale for Head and Neck Cancer was used to assess functional outcomes in laryngectomees. While our study cohort did not include all post-laryngectomy patients under follow up at our institution, our data accounted for over 90 per cent of the current case load, and are a good representation of a single centre's experience. Our results confirm that the majority of laryngectomees do well with respect to swallowing quite early on after the procedure. However, our results suggest relatively poorer speech and public eating function in the early months after treatment. The trend towards higher public

eating scores over time may indicate greater confidence in eating as patients become more familiar with their neopharynx and appreciate the limitations of swallowing. This has been demonstrated not only in this cross-sectional cohort, but also in paired samples. Such confidence may increase in tandem with improvement in speech over time; this too is indicated in our results. The speech score improvement observed in our patients may also be a reflection of their increasing expertise in the use of their valve, and the benefit of continuing speech and language therapy support. Such a post-laryngectomy speech score improvement has not previously been demonstrated. This study also provides robust baseline data enabling comparison of the functional results of laryngectomy versus organ preservation protocols.

Previous reports on the use of the Performance Status Scale for Head and Neck Cancer in laryngectomees have involved comparatively smaller series.

Fung *et al.* used the PSS-HN questionnaire in 14 patients.¹⁴ The frequency of responses mirrored our results, with the majority of patients scoring high in the 'eating in public' and 'normalcy of diet' domains. Also similarly, only a small percentage (7.1 per cent) said their speech was always understandable.

- **Total laryngectomy affects patients' speech and swallowing. This study aimed to assess laryngectomees' post-operative speech and swallowing outcomes**
- **The Performance Status Scale for Head and Neck Cancer was used to assess speech comprehensibility, eating in public and normalcy of diet, in a cross-sectional survey of disease-free laryngectomees**
- **The Performance Status Scale for Head and Neck Cancer scores improved over time, especially those for speech and eating in public, perhaps reflecting patients' increasing confidence in social interaction and their familiarity with their surgically restored voice**

List *et al.* used the PSS-HN questionnaire prospectively in seven patients undergoing total laryngectomy.¹⁵ Median scores for the 'normalcy of diet', 'speech' and 'eating in public' domains were 50, 12.5 and 100 at 12 weeks, respectively, rising to 100 in all three domains by six months.

As part of a study to assess word and sentence intelligibility, Meyer *et al.* used the Scale questionnaire in head and neck cancer survivors, 16 of whom were laryngectomees.⁹ This sample size was large enough to justify some general conclusions, but did not permit further analysis to identify factors associated with a good or poor outcome post-laryngectomy. While it was evident that patients experienced poor performance in the early months, the data from this study were unable to precisely identify temporal trends in improvement. A prospective study using the PSS-HN questionnaire scores at predefined time points would help in this respect.

Functional assessment should form an integral part of outcomes assessment after the treatment of head and neck cancer. The Performance Status Scale for Head and Neck Cancer collects information about swallowing, eating and speech function in a single questionnaire which can be easily summarised in an easily comprehensible, patient-friendly format. The use of the PSS-HN questionnaire as a screening measure for speech and normalcy of diet (as a surrogate indicator of swallowing function) provides valuable data for pre-operative counselling. For example, in our unit we now inform patients prior to a laryngectomy that nearly 60 per cent of individuals having the operation can manage a full diet with no restrictions, and almost 90 per cent can eat at least soft, chewable food. This data also facilitates follow up and interdisciplinary team communication, assists identification of patient needs, and expedites appropriate referral.

Conclusion

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