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Quality of Life Impacts Following Surgery for Advanced Head and Neck Cancer

Cameron Douglas[a], Lyndel Hewitt[a, b, c, d], Takako Eva Yabe[a, b], Jenny Mitchell[a], Bruce Ashford[a, b, c]

Abstract

Background: Understanding the impact of surgery on patients will enable clinicians to provide evidence-based perioperative management. This study aimed to investigate the quality of life (QoL) impacts following head and neck surgery for advanced stage head and neck cancer.

Methods: Head and neck cancer survivors were invited to complete five validated questionnaires to investigate QoL. Associations between QoL and patient variables were analyzed. Variables included age, time since operation, length of surgery, length of stay, Comorbidity Index, estimated 10-year survival, sex, flap type, treatment and cancer type. Outcome measures were also compared to normative outcomes.

Results: The majority of participants (N = 27; 55% male; mean (standard deviation) age: 62.6 (13.8) years; mean time since operation: 801 days) had a squamous cell carcinoma (88.9%) and free flap repair (100%). Time since operation was significantly ($P < 0.05$) associated with higher rates of depression ($r = -0.533$), psychological needs ($r = -0.0415$) and physical/daily living needs ($r = -0.527$). Length of surgery and length of stay were significantly associated with depression ($r = 0.442$; $r = 0.435$) and length of stay was significantly associated with speaking difficulties ($r = -0.456$). There was a significant association between work and education scores with age ($r = 0.471$), length of surgery ($r = 0.424$), Comorbidity Index ($r = 0.456$) and estimated 10-year survival ($r = -0.523$).

Conclusions: Age, time since operation, length of surgery, length of stay, Comorbidity Index and estimated 10-year survival were the outcomes associated with QoL. Patient-reported outcome measures and psychological support could be included in the standard care pathway for head and neck cancer patients to ensure holistic management of their condition.

Keywords: Cancer; Surgery; Quality of life; Head and neck

Introduction

In 2022, head and neck cancer was amongst the 10 most common cancers in Australia [1]. Head and neck cancer encompasses a variety of cutaneous, mucosal, salivary and endocrine malignancies. The overall chance of surviving these cancers 5 years after diagnosis (2013 - 2017) is 72%, indicating that the majority of patients diagnosed with head and neck cancer have a curable disease. By the end of 2016, approximately 17,220 Australians were living with head and neck cancer [2]. A confounding factor in understanding quality of life (QoL) impacts in this understudied cancer group is the innate heterogeneity of the individual cancer and their therapy and prognosis.

Surgery is a mainstay of therapy for a variety of head and neck cancers. Surgery can involve ablative and reconstructive elements [3]. Such surgical procedures are, by necessity, invasive, making head and neck cancer patients susceptible to functional loss and activity limitations [4]. In addition, treatment can also affect appearance, mental health and basic functions such as speaking and eating [5]. As a result, advanced head and neck cancer treatment can often substantially impact a patient's QoL [6].

A recent scoping review of the literature concerning patients with head and neck cancer identified that data were lacking on patient reported outcomes and that more studies are needed in survivorship populations [7]. The current clinical practice guidelines for head and neck cancer include incidence, diagnosis, staging and risk assessment, treatment, evaluation and follow-up [8]. Surgical data (time since operation, length of operation and hospital stay) or morbidity markers (estimated 10-year survival and Comorbidity Index) have been previously analyzed as predictors of morbidity and complications following free flap reconstruction [9]. Similarly, the relationship of these variables with QoL outcomes could be helpful in identifying those patients at higher risk of developing poor QoL post-surgery. Specific strategies to assess and

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[a] Illawarra Shoalhaven Local Health District, Wollongong Hospital, Wollongong, NSW 2500, Australia
[b] Illawarra Health and Medical Research Institute, Wollongong, NSW 2522, Australia
[c] Faculty of Science, Medicine and Health, University of Wollongong, Wollongong, NSW 2522, Australia
[d] Corresponding Author: Lyndel Hewitt, Research Central, Wollongong Hospital, Wollongong, NSW 2500, Australia. Email: Lyndel.Hewitt@svha.org.au

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manage the QoL outcomes post-surgery are lacking. Significantly, patients' loss of wellbeing and QoL have been linked to reduced survival [5, 10, 11].

In this study, we wished to capture those patients most at risk of functional limitation or poor QoL, which we deemed to be those with resectable cancer requiring free flap reconstruction. Further understanding the impact of this surgery on head and neck cancer patients will enable clinicians to provide a more informed and considered approach to these issues. We hypothesize that the QoL following head and neck surgery for advanced stage head and neck cancer may be reduced compared to the healthy population. To inform an evidence-based clinical care pathway, further investigation is required using a wide range of validated QoL measures in advanced head and neck cancer surgical patients. This study aimed to investigate the QoL impacts following head and neck surgery for advanced stage head and neck cancer.

Materials and Methods

Study design and setting

This cross-sectional study investigated the QoL impact following surgery for advanced head and neck cancer. In our cohort, this included oral cavity squamous cell carcinoma (SCC), salivary grand tumors and cutaneous malignancies. Participants (over 18 years of age) were included if they underwent a surgical procedure for head and neck malignancy and required free flap reconstruction from 2018 to 2021. The study was conducted in a single head and neck cancer unit in New South Wales, Australia. A participant list was developed (N = 96), those that had died were removed (n = 35), and invitations were sent via email or mail to participate in the study (n = 61). QoL was assessed using self-reported validated questionnaires. The University of Wollongong and Illawarra Shoalhaven Local Health District Health and Medical Human Research Ethics Committee approved the study (2021/ETH01277). This study followed the guidelines in the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement [12], and the principles of the Declaration of Helsinki.

Participants and data collection

The participants were invited to complete the questionnaires independently (online link or paper copy) or over the phone with one of the investigators. There were five questionnaires in total: tumor-specific QoL (European Organisation for Research and Treatment Cancer Quality of Life Questionnaire - Head and Neck Cancer (EORTC-QLQ-HN43)) [13]; severity anxiety/depression (Hospital Anxiety and Depression Scale (HADS)) [14]; participation (Impact on Participation and Autonomy (IPA)) [15]; supportive care needs (Supportive Care Needs Survey Short-Form 34 (SCNS-SF34)) [16] and the FACE-Q Head and Neck Cancer Module [17]. Multiple questionnaires were chosen as they determine different factors for consideration and analysis.

Tumor-specific QoL (EORTC-QLQ-HN43)

The EORTC-QLQ-HN43 incorporates 12 multi-item scales to assess pain in the mouth, swallowing, problems with teeth, dry mouth and sticky saliva, problems with senses, speech, body image, social eating, sexuality, problems with shoulder, skin problems and fear of progression [13]. The module also includes seven single items which assess problems with opening the mouth, coughing, social contact, swelling in the neck, weight loss, wound healing and neurological. All of the scales range in a score from 0 to 100. A high score represents a high level of symptomatology or problems in that area. Outcomes are calculated by first calculating the raw score:

Then standardizing the score (S) to a
0 - 100 range: $S = (RS - 1) \times 100$

HADS

The HADS is a self-reported questionnaire asking participants to identify how they have been feeling in the past week [14]. Results are classified into category ranges of 0 - 7 (normal), 8 - 10 (borderline abnormal), and 11 - 21 (abnormal). Anxiety and depression are categorized separately and calculated by adding each question's score to determine the total score.

IPA questionnaire

The IPA questionnaire includes questions about daily activities to determine how a health condition affects autonomy and participation in everyday life [15]. The IPA is divided into subscales to assess a person's autonomy indoors and outdoors, family role, social life and relationships, and work and education. In addition, there are nine categories to determine if the patient has any problems (i.e., none, minor, major). These categories are mobility, self-care, activities in and around the home, looking after money, leisure time, social life and relationships, helping and support, paid or voluntary work, and education and training. For each domain, the participation and problem-experience scores are calculated using the median score between 0 and 4 (0 being no limitation, 4 representing severe limitation).

SCNS-SF34

The SCNS-SF34 is a 34-item validated self-reported questionnaire for measuring the perceived needs of patients with cancer across five domains [16]. The five domains are psychological needs, health system and information needs, physical and daily living needs, patient care and support needs, and sexuality needs. The individual items within a domain are added and then standardized to determine the overall score (range from 0 to 100). If "m" equals the number of questions in a scale and "k" is the value of the maximum response for each item, the standardized score is obtained by summing the individual items, subtracting "m", and then multiplying the resulting value by 100/(m × (k - 1)). A higher score is indicative of a higher need of support required.

FACE-Q Head and Neck Cancer Module

The FACE-Q Head and Neck Cancer Module is a tool to assess health-related QoL relating to the head and neck [17]. The scales are divided into appearance, function, psychosocial, and the patient's experience. Functional questions relate to eating and drinking, oral competency, saliva, speech, swallowing, appearance and smiling. Psychosocial scales relate to the distress caused by eating, drooling, speaking, appearance, smiling and cancer worry. Experience scales relate to the patient's satisfaction with information. Outcomes range from 0 to 100, and higher scores indicate better outcomes, except for cancer worry, where a lower score indicates a more favorable outcome.

Statistical analysis

Descriptive statistics were reported by means and standard deviations (SDs) for continuous variables and number and percentage for categorical variables. Jamovi (Version 1.6) was used for statistical analysis [18]. Pearson's correlation coefficient (r) was used to examine whether continuous variables were associated with QoL outcomes. These included age, time since operation, length of surgery, length of stay, Comorbidity Index, and estimated 10-year survival and were chosen based on clinical relevance, clinician's expertise and previous literature [9]. Of the five QoL scales used some compute multiple scores. To avoid an increase in type one errors, analyses were conducted only on those items that showed a clinically relevant unfavorable outcome. Associations between QoL and categorical variables such as sex, flap type, type of treatment and type of cancer were determined by Chi-square test of association. A P-value of < 0.05 was considered statistically significant. The outcome measures were compared to the normative outcomes for this population (age and condition) if available or presented descriptively. Regression analysis was not conducted due to the small sample size. Missing data were not included in the analysis and are reported in Table 1.

Results

Participant information

Sixty-one participants were invited to participate in the study, 27 consented (44% recruitment rate), 25 declined to participate, seven were not able to be contacted and two had passed away. Not all participants completed each questionnaire. There were 15 male and 12 female participants. The majority of participants had an SCC (88.9%) and a repair using a free flap (44% radial forearm; 33% anterolateral thigh; 18.5% fibula). The estimated 10-year survival rate was 46.2%, calculated using the Charlson Comorbidity Index (CCI). The mean length

Table 1. Relationship[a] Between Patient and Surgical Related Variables With Quality of Life

	HADS (anxiety[b])	HADS (depression[b])	SCNS (psychological needs)[c]	SCNS (physical and daily living needs)[c]	EORTC (fear of progression)[c]	EORTC (body image)[c]	FACE-Q (speaking)	FACE-Q (appearance distress)	IPA (work and education)[c]
Age	-0.232	-0.068	-0.183	-0.031	-0.082	-0.188	0.253	0.230	0.471*
Time since operation	-0.165	-0.533**	-0.415*	-0.527**	-0.284	-0.298	0.152	0.384	-0.294
Length of operation	0.079	0.442*	0.202	0.135	0.388	0.299	-0.142	-0.262	0.424*
Length of stay	0.223	0.435*	0.241	-0.038	0.225	0.378	-0.456*	0.023	0.119
Comorbidity Index	-0.196	0.045	-0.032	0.138	0.008	-0.053	0.248	0.069	0.456*
Estimated 10-year survival	0.187	-0.089	0.049	-0.121	-0.034	0.044	-0.221	-0.030	-0.523*

*$P < 0.05$. **$P < 0.01$. [a]Correlation (Pearson's r); N = 27. [b]n = 1 missing data. [c]n ≤ 4 missing data.

Table 2. Participant Information[a]

	Mean	SD
Age (years)	62.6	13.8
Time since operation (days)	801.1	413.8
Length of operation (min)	497.0	124.6
Length of stay (days)	15.8	10.1
Comorbidity Index (maximum of 37 points)	4.2	1.3
Estimated 10-year survival (%)	46.2	31.3

	n	%
Sex		
Male	15	55.6
Female	12	44.4
Flap type		
Radial forearm	12	44.4
Anterolateral thigh	9	33.3
Fibula	5	18.5
Latissimus dorsi	1	3.7
Treatment type		
Surgery alone	10	37.0
Surgery plus radiotherapy	15	55.6
Surgery plus combination (chemotherapy and radiotherapy)	2	7.4
Cancer type		
Squamous cell carcinoma	24	88.9
Basal cell carcinoma	1	3.7
Mucoepidermoid carcinoma	1	3.7
Papillary thyroid carcinoma	1	3.7
Cancer stage		
T stage 1	11	40.7
T stage 2	3	11.1
T stage 3	8	29.6
T stage 4	5	18.5

[a]N = 27, no missing data. SD: standard deviation; n: number.

of time since surgery was 801 days (range 191 - 1,477 days). Additional information regarding the included participants is reported in Table 2. Associations between patient and surgical variables and QoL are reported either in the associated text or in Table 1. Sex, type of treatment, type of flap or type of cancer were also examined for associations with the nine QoL scores (see Table 1 for specific scores). However, no significant associations were determined.

EORTC-HN43

Out of the 24 respondents who completed this survey, the highest mean and SD scores were seen in fear of progression (mean = 45.8, SD = 34.1), problems with teeth (M = 42.6, SD = 34.2), body image (M = 42.1, SD = 32.8) and problems opening their mouth (M = 37.7, SD = 39.3). These outcomes were higher than those reported in the literature [19]. Participants were less likely to have problems with weight loss (M = 16.7, SD = 31.1), wound healing (M = 16.6, SD = 31.1), pain in the mouth (M = 17.7, SD = 21.9) or swallowing (M = 18.1, SD = 19.6). These scores were similar to other survivors reported in the literature [19]. There was no association between the patient variables and the highest EORTC-HN43 scores.

HADS

Out of 25 respondents, the average anxiety score was 7 out of 21 (normal range). Eight respondents (32%) tallied a score of

11 or greater (abnormal). In terms of depression scores, results were slightly lower, with an average score of 6.2 out of 21 (normal range), and only five patients (20%) had an abnormal score of 11 or greater. Further analysis demonstrated that depression scores were lower in participants with a greater length of time elapsed since surgery, with a negative correlation coefficient of -0.533 ($P < 0.01$). Both length of stay and length of surgery were positively associated with a higher depression score ($r = 0.442$, $P < 0.05$ and $r = 0.435$, $P < 0.05$, respectively). There was no association between higher scores of depression (≥ 8) with sex (X^2 (1, N = 25) = 1.73, P = 0.188), or type of cancer (X^2 (3, N = 25) = 2.27, P = 0.518).

IPA

The IPA scores across 24 participants demonstrated the following median (range) scores for each domain: autonomy indoors = 0 (0 - 1) (very good); family role = 1 (0 - 2) (good); autonomy outdoors = 1 (0 - 3) (good); social life and relationships = 0 (0 - 3) (very good); and work and education = 2 (0 - 3) (fair). There was a significant association ($P < 0.05$) between work and education IPA scores with age ($r = 0.471$), length of surgery ($r = 0.424$), Comorbidity Index ($r = 0.456$) and estimated 10-year survival ($r = -0.523$).

SCNS-SF34

Out of the five domains included in this questionnaire, our participant cohort indicated that their greatest area of need was psychological, with a mean (SD) score of 36.3 (29.9) out of 100 from the 23 respondents. The lowest area of need was concerning sexuality, with a mean (SD) score of 17.8 (19.0). Psychological needs were associated with time since surgery ($r = -0.415$, $P < 0.05$), meaning that patients who were further from surgery had lower (better) scores for psychological needs than participants who had their surgery more recently. Physical and daily living needs were also less in respondents who had a greater length of time from having their surgery ($r = -0.527$, $P < 0.01$).

FACE-Q

From 27 respondents, the lowest mean (SD) scores (indicating less favorable outcome) were seen in speaking (M = 52.8, SD = 36.4), distress related to appearance (M = 53.3, SD = 41.3), physical appearance of the face (M = 58.3, SD = 32.6) and distress related to eating (M = 59.6, SD = 36.4). The highest mean scores (more favorable outcome) were related to distress related to drooling (M = 76.6, SD = 33.9), satisfaction with information (M = 74.1, SD = 23.5), swallowing (M = 72.6, SD = 22.3), distress related to smiling (M = 71.5, SD = 33.8) and oral competence (M = 70.3, SD = 25.7). The mean (SD) score for cancer worry, where a lower score indicates less worry, was 40.2 (24.7) out of 100. Following statistical analysis, length of stay was significantly associated with a lower (worse) score on speaking, where r was -0.456 ($P < 0.05$). Scores were similar to other literature, except for cancer worry, which was higher than previously reported [17].

Discussion

This study provides insight into the impact of head and neck surgery on QoL in cancer survivor patients that required free flap reconstruction. Participants who had their surgery more recently were associated with higher depression scores, psychological needs and physical/daily living needs. A longer length of surgery and longer length of stay also significantly correlated with higher scores for depression. In addition, longer length of stay was also associated with problems with speaking (being understood, difficult to understand, making certain sounds, using certain letters, saying certain words, being understood over the phone, and needing to repeat themselves to be understood). Difficulty with work and education was associated with age, length of surgery, Comorbidity Index and estimated 10-year survival. There was no significant association between QoL and sex, type of treatment, type of flap or type of cancer.

The main functional problems (QLQ-HN43) reported to be experienced by this cohort were problems with teeth, trismus and body image. Compared to published literature [19], these values are higher than previously reported. This is not unexpected given the cohort for this study contained only participants who had surgery for advanced disease requiring free flap reconstruction. Given the central nature of the face and mouth in terms of body image, the effect of dental problems (particularly therapies to overcome trismus) may have an important role to play in this cohort. Radiotherapy plays a central role in the treatment of head and neck cancers, and a recent systematic review demonstrated that radiotherapy leads to a dose-dependent impact on swallowing and mouth opening [20]. Other values, such as pain in the mouth, swallowing, senses, coughing, sexuality, neurological problems and wound healing, were similar to the mean values reported in the literature [19]. Participants also reported speaking as one of the issues with the most impairment (FACE-Q). Developers of this tool found that radiation therapy contributed to a worse outcome regarding speaking scores, eating, oral competence, salivation and swallowing [17]. Whilst 15 of our 27 participants underwent radiotherapy, there was no correlation between the type of treatment (surgery alone, or with chemotherapy, radiotherapy or both) and QoL outcomes.

The SCNS-SF34 scores showed the greatest area of need to be psychological. Specifically, our participants scored highly on questions related to fears of cancer spread, uncertainty regarding the future, and feeling down, depressed or anxious. This was also found with regards to the FACE-Q cancer worry scores being higher than the current literature. From the QLQ-HN43 measures, fear of progression was the highest reported symptom, alongside problems with teeth. This is consistent with a large multi-center study examining information provision and the needs of almost 600 head and neck cancer patients following treatment. They found that half of the respondents had received little to no information regarding coping with stress and anxiety, and 29% of the cohort desired more information on this topic [21]. Furthermore, 20% of patients would have preferred more information about support groups [21]. Similarly, a study examining the needs of melanoma patients at a single institution demonstrated that the primary moderate-high level needs items included information about the risk of recurrence, fears about cancer spread and advice about potential effects of treatments [22]. In terms of mental health, 32% and 20% of respondents had abnormal scores on depression and anxiety HADS scores, respectively. This indicates that there is still a large portion of these patients who, due to the sequelae of their disease and its treatment, are experiencing troubling symptoms. Reassuringly, depression scores were lower following a greater length of time since surgery.

The QoL tools used in this study revealed that participants had ongoing body image concerns. From the FACE-Q scores, distress related to appearance was the second lowest mean score across respondents. Reviewing the QLQ-HN43 scores, body image had the second highest mean score, indicating a burden for participants. These findings are expected and consistent with other studies reporting that up to 75% of surgically treated head and neck survivors have body image concerns. In addition, body image disturbance is more likely in head and neck cancer patients who require reconstruction and have advanced disease or issues involving the oral cavity [6, 23].

Given the above findings, the logical next step may be to address the factors impacting the QoL of head and neck survivors, particularly those who have undergone reconstruction. Studies have demonstrated that patient-reported outcome measures (PROMs) are a useful way to detect impairments such as symptoms, functional limitations, body image disturbance or factors that may have otherwise gone unrecognized [6, 24-27]. However, a recent multi-center study that examined the use of PROMs in cancer patients demonstrated that there are multiple barriers to their implementation. The barriers reported are time constraints, patient literacy levels and reluctance to overburden patients [23]. Whilst PROMs are not routinely implemented in this patient population, most clinicians recognize they can be useful. In addition, studies suggest there may be a survival benefit in the use of subjective measures. A recent trial of cancer patients undergoing chemotherapy randomized patients into a usual care group or usual care with regular patient reporting of symptoms via video group. This study demonstrated that the group that reported their symptoms tolerated a longer course of chemotherapy and also lived longer [25, 26].

The overall QoL and general health in head and neck cancer survivors has tended to match the general population over time. However, disease-specific QoL measures demonstrate that patients still suffer the ill effects of their disease and treatment [28-30]. Factors such as low income and single status have also been shown to impact this cohort [28]. Our findings also support the role of perioperative patient education at a level suitable for individual patients [21].

The strengths of this study are the extended follow-up duration and the use of multiple validated tools. The limitations of this study include the small number of participants and the lack of preoperative testing or testing at regular intervals post-treatment. Despite the small sample size, this study is important to demonstrate the usefulness of PROMs as part of patient holistic care within a clinical context. Given the evidence that subjective outcomes go unmeasured through traditional oncology care programs, it may be essential to implement PROMs as part of standard practice in head and neck cancer care. To improve the QoL of patients, we propose that cancer centers implement measures such as pre- and post-treatment PROM scoring using validated tools, provide regular reporting of symptoms either in person or via phone/video, and provide a more accessible support service to assist patients with their psychological care needs throughout and following treatment. As treatments continue to improve, it can be expected that head and neck cancer patients will have greater longer-term survival. As such, it is crucial to attempt to reduce their functional impairments and improve their symptoms and QoL over time, particularly in patients who have undergone reconstruction. Further assessment and psychological support may also benefit head and neck cancer survivors. Thus, the implementation of this support in the current clinical care pathway requires consideration.

Conclusion

The impact on QoL following head and neck surgery for advanced stage head and neck cancer has been reported. QoL of this participant cohort was similar to other published literature. Age, time since operation, length of surgery, length of stay, Comorbidity Index and estimated 10-year survival were the outcomes associated with QoL. PROMs and psychological support could be included in the standard care pathway for head and neck cancer patients to ensure holistic management of their condition.

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Conflict of Interest

The authors have no relevant financial or non-financial conflict of interest to disclose.

Informed Consent

Not applicable.

Author Contributions

BA, LH and CD contributed to the overall study rationale, design and methods development. LH analyzed the data. CD led drafting of the manuscript. All authors contributed to the drafting of the manuscript and approved the final version. All authors read and approved the final manuscript.

Data Availability

The data that support the findings of this study are available from the corresponding author, LH, upon reasonable request.

Abbreviations

SCC: squamous cell carcinoma; STROBE: Strengthening the Reporting of Observational Studies in Epidemiology; EORTC-QLQ-HN43: European Organisation for Research and Treatment Cancer Quality of Life Questionnaire - Head and Neck Cancer; HADS: Hospital Anxiety and Depression Scale; IPA: Impact on Participation and Autonomy; SCNS-SF34: Supportive Care Needs Survey Short-Form 34; CCI: Charlson Comorbidity Index; SD: standard deviation; PROMs: patient-reported outcome measures

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