ISSN: 3033-3504

Journal of Clinical Medicine and Regenerative Medicine

SCIENTIFIC Research and Community

Research Article

Open Access

Assessment of Functional Outcomes and Quality of Life in Patients with Tongue Cancer after Partial Glossectomy

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ABSTRACT

Introduction: Tongue cancer and its therapy affect significantly patients' quality of life (QoL) and functionality.

Purpose: To determine the consequences of glossectomy on patients' QoL and functionality.

Material and Methods: Between October 2021 and January 2022, we conducted a cross-sectional observational study of 40 patients with tongue cancer who underwent partial glossectomy and neck dissection in the University Clinic of Oral and Maxillofacial Surgery of General Hospital of Athens "Evangelismos". Patients completed the EORTC QLQ-C30 and QLQ-H&N43 questionnaires and the Eastern Cooperative Oncology Group Performance Status Scale (ECOG-PS).

Results: Patients were aged 23-83 years. The majority were men (70%), married (55.0%), with higher education (40.0%), working (52.5%), were undergoing in postoperative radiotherapy and chemotherapy (50%) and reported the difficulty in speaking as the most serious problem (42.5%). According to the QLQ-H&N43 questionnaire, fear of disease progression, problems with teeth, social eating and speech disorders had a negative influence on QoL. On the ECOG-PS, 95% of patients were grade 1 and 5% grade 2. A positive correlation was found between the increase of the number of symptoms ($p<0.001$), low educational level ($p<0.001$) and smoking ($p=0.023$) and low global health status/QoL. Finally, no correlation was detected between QoL and use of adjuvant therapies ($p>0.05$).

Conclusion: The main problems at least one year after partial glossectomy are difficulty in speaking and swallowing, as well as anxiety about disease progression. However, the majority of patients reported that their functionality had improved with time and evaluated their QoL as satisfactory.

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Received: October 11, 2023; **Accepted:** October 25, 2023, **Published:** November 28, 2023

Keywords: ECOG Scale, Functionality, Glossectomy, Tongue Cancer, Quality of life

Introduction

The tongue is the primary organ for speaking, chewing, swallowing and therefore for social interaction, communication and survival. Additionally, it creates the sense of taste and contributes to the esthetic appearance of the face [1-3]. Tongue cancer is the most common type in the oral cavity and the most frequent locations being the base and lateral surface and is characterized by a high rate of local recurrence and neck lymph node metastases [1-6]. Treatment options include surgical resection (glossectomy) combined with neck dissection (ND), radiotherapy, chemotherapy, immunotherapy and their combination, based on guidelines (NCCN 2022) [7]. Small lesions (up to 2-3 cm) can be treated with a wedge-shaped excision, closure and shaping of the remaining tongue. However, larger lesions require wider excisions up to total glossectomy and corresponding reconstruction with flaps (local, regional, free) [3,7,8].

The preservation of quality of life (QoL) in patients with tongue cancer is of paramount importance, as they have to deal with the consequences of both the disease and the treatment. These include disturbances of swallowing and speech, which are proportional

to the extent and the location of the lesion, as well as the method of treatment and reconstruction [3,4,9,10].

The aim of the present study was to assess the functionality and QoL of patients with tongue cancer who had undergone segmental glossectomy and ND, with or without adjuvant therapy, based on their personal assessment and perception.

Materials & Methods

We conducted an observational, cross-sectional study of 40 oncology patients in the University Clinic of Oral and Maxillofacial Surgery of General Hospital of Athens "Evangelismos", who were treated for tongue cancer with partial glossectomy and ND between October 2021 and January 2022.

The inclusion criteria for the study were age >18 years, the absence of recurrence in the tongue after surgery, time of at least one year since the surgical resection and the ability to read and write in the Greek language. All eligible patients were enrolled once, regardless of the number of reexaminations performed during the study period.

The study was approved by the "Evangelismos" General Hospital Ethics Committee. All patients were informed about the purpose of the study and signed an informed consent document before their participation.

The Data were collected using Three Questionnaires:

- *The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30, version 3)*. This consists of 30 questions that can be answered on a Likert scale (from 1-4 for the first 28 questions and 1-7 for the last two questions). It assesses patients' activity level, presence of symptoms and psychological status, in six scales for functionality (higher score indicates better QoL), nine for symptom intensity (lower score indicates better QoL) and scales for the global health status/QoL [11-13].
- *The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Head and Neck Module (EORTC QLQ-H&N43)*. This includes 43 closed-type questions using a Likert scale from 1 to 4. It assesses the level of physical activity, symptoms and changes in social and family life in 20 components, where a higher score indicates more severe symptomatology [14].
- *A questionnaire created specifically for this study* to record the participants' demographic data (age, sex, job, etc.) and information about their treatment.

In addition, we used the Eastern Cooperative Oncology Group Performance Status scale (ECOG-PS), which assesses parameters such as walking ability and the need for assistance in performing basic daily activities. It evaluates patients' functionality on a scale with values from 0, corresponding to normal functional status, to 5, corresponding to death. ECOG-PS uses a 5-point score to estimate performance status. Values of 0 and 1 are considered to be "good" functioning, while a score of 2 to 4 indicates "poor" functioning [15-17].

The analysis of the research data was carried out using SPSS software (IBM Corp. Released 2019, IBM SPSS Statistics for Windows, v.26.0, Armonk, NY: IBM Corp.). Initially, the frequency distributions of the descriptive characteristics and the disease characteristics of the 40 patients were computed.

The consistency of responses to the entire QLQ-C30 scales and the EORTC QLQ-H&N43 cancer symptomatology scales was calculated using the Cronbach α index. Their distributions were checked via Blom's method (QQ plot), and univariate correlation of their scales and subscales (both with each other and with the patients' characteristics) was performed using the non-parametric Spearman method, given their strong asymmetry. Finally, the scores from the QoL scales and symptomatology in relation to combined postoperative adjuvant treatments were compared using the methods of Kruskal–Wallis and Mann–Whitney. The acceptable level of significance was set at 0.05.

Results

Forty patients (70.0 % males), mean age 55.8 years (standard deviation [SD]: 18.0, range 23-83 years), completed all questionnaires. Of these patients, 27.5% had primary or no education and 40.0% had higher education; 55.0% were married and 60.0% lived with a spouse and/or children. Regarding health habits, most patients stated that they were smokers (57.5%), 17.5% consumed only alcohol and 17.5% had both habits (Table 1).

Table 1: Patients' demographic data

		n	%
Sex	men / women	28 / 12	70.0 / 30.0
Age, years	mean (SD)	55.8 (18.0)	
	≤ 50	16	40.0
	>50	24	60.0
Education	primary or no education	11	27.5
	high school	13	32.5
	higher education	16	40.0
Marital Status	married	22	55.0
	unmarried, divorced, widow(er)	18	45.0
Living	husband/wife or/and children	24	60.0
	parents, brothers	6	15.0
	alone	10	25.0
Occupation	working	21	52.5
	retired, unemployed	19	47.5
Health habits	smoking	23	57.5
	alcohol	7	17.5
	smoking and alcohol	7	17.5

The average waiting time for surgery was estimated at 30 days (SD: 14, range 8-70 days). As regards treatment, 80.0% of patients had undergone adjuvant radiotherapy, 52.5% chemotherapy, while 17.5% received no other treatment after glossectomy. Postoperatively, 42.5% of patients followed a program with physical/speech therapies; of these patients, 64.7% reported the program's contribution to improving their condition as "very significant" and 29.4% as "significant".

On the ECOG scale, 95.0% of patients had a score of 1 and 5% a score of 2. Their mean level of global health status/QoL, as measured by the EORTC QLQ-C30, was 72.5, which corresponds to high levels of QoL. In the functioning subscales, higher mean levels were found for cognitive (93.8) and lower for social (63.8) functioning. In the symptom/items scales, the lowest mean score (best QoL) was recorded for nausea and vomiting (1.3) and the

highest (worst QoL) in patients with financial difficulties (44.2) (Table 2).

Table 2: Scoring of the EORTC QLQ-C30 scale

	Mean	SD	Median	Range
Quality of Life (QLQ-C30)				
Functional scales (higher levels show better Qol)				
Global health status/QoL	72.5	15.8	66.7	16.7-100
Cognitive functioning	93.8	14.0	100.0	33.3-100
Physical functioning	82.5	18.2	86.7	33.3-100
Emotional functioning	76.5	22.5	79.2	0-100
Role functioning	65.0	28.2	66.7	0-100
Social functioning	63.8	24.4	66.7	0-100
Symptoms Scales/items (lower levels show better Qol)				
Financial difficulties	44.2	30.6	33.3	0-100
Fatigue	32.8	21.5	33.3	0-77.8
Insomnia	27.5	24.9	33.3	0-100
Appetite loss	17.5	23.9	0.0	0-66.7
Pain	11.3	19.0	0.0	0-83.3
Dyspnoea	5.8	16.7	0.0	0-66.7
Constipation	3.3	12.6	0.0	0-66.7
Diarrhoea	1.7	7.4	0.0	0-33.3
Nausea and vomiting	1.3	4.4	0.0	0-16.7
Sexuality	31.7	35.4	33.3	0-100
Problems with shoulder	9.2	21.7	0.0	0-100
Skin problems	9.2	12.6	0.0	0-44.4
Fear of progression	73.3	27.7	66.7	0-100
Problems opening mouth	26.7	26.4	33.3	0-66.7
Coughing	0.8	5.3	0.0	0-33.3
Social contact	37.5	34.7	33.3	0-100
Swelling in the neck	3.3	12.6	0.0	0-66.7
Weight loss	28.3	29.8	33.3	0-100
Problems with wound healing	10.0	25.3	0.0	0-100
Neurological problems	3.3	16.5	0.0	0-100

*The alpha coefficient in QLQ-C30 was 0.916 (excellent reliability coefficient).
SD: standard deviation

*The alpha coefficient in QLQ-C30 was 0.955 (excellent reliability coefficient). SD: standard deviation

In the EORTC QLQ-H&N43 questionnaires, the mean of the total symptomatology score (out of 20 symptoms) was 28.4 (median 27.9). The highest mean levels (worse symptomatology) were reported for the items "Fear of disease progression" (73.3), "Problems with teeth" (48.1), "Social Eating" (39.8), and "Speech" (39.0%), while "Coughing" (0.8%), "Swelling in the neck" (3.3%) and "Neurological problems" (3.3%) were the least reported symptoms (Table 3). The symptoms with the highest prevalence were "Fear of Disease Progression" (95.0%), "Speech" (95.0%), "Social Eating" (92.5%), "Problems with teeth" (90.0%) and "Swallowing" (87.5%). In contrast, "Swelling in the neck" (7.5%), "Neurological Problems" (5.0%) and "Coughing" (2.5%) had the lowest scores. A positive correlation was found between the increase of the number of reported symptoms (QLQ-H&N43) and low global health status/QoL (QLQ-C30) (rho=-0.592, p<0.001).

Table 3: Patients' symptomatology scores according to the EORTC QLQ-H&N43 scale

Symptoms	mean α	SD	Median	Range
Total symptomatology score	28.4	15.8	27.9	4.7-71.3
Pain in the mouth	17.3	17.6	8.3	0-75.0
Swallowing	29.4	24.5	20.8	0-91.7
Problems with teeth	48.1	30.7	55.6	0-100
Dry mouth and sticky saliva	33.3	25.0	33.3	0-66.7
Problems with senses	9.6	13.5	0.0	0-50.0
Speech	39.0	23.8	33.3	0-80.0
Body image	28.3	30.5	16.7	0-100
Social eating	39.8	25.1	41.7	0-100

Table 4 summarizes the correlations between the total scores on the EORTC QLQ-C30 and QLQ-H&N43 scales and the patients' characteristics. It was observed that patients with a lower level of education (rho=0.565, p<0.001) and smokers (rho= 0.359, p=0.023) had a worse global health status/QoL. However, no significant correlations were found between total symptomatology (QLQ-H&N43) and patient characteristics (p>0.05). Similarly, no significant differences were found in the QoL scores and symptomatology in relation to adjuvant treatments (p>0.05) (Table 5).

Table 4: Correlation of scoring of EORTC QLQ-C30 scale and symptomatology scale of EORTC QLQ-H&N43 with patients' characteristics

	Quality of Life – Global health status QLQ-C30 (higher levels → (better Qol)		Total Symptomatology QLQ-H&N43 (higher levels) → more severe symptomatology)	
	rho-Spearman	p-value	rho-Spearman	p-value
Sex (1: male, 2: female)	-0.079	0.630	0.156	0.336
Age (years)	-0.225	0.164	-0.082	0.616
Education (1: *primary or no education*, 2: high School, 3: higher education)	0.565	<0.001	-0.140	0.390
Family Status (1: married, 2: unmarried/divorced/ widow(er))	0.079	0.629	0.184	0.257
Occupation (1: working, 2: retired/ unemployed)	-0.035	0.831	-0.169	0.296
Smoking (1:no, 2: yes)	-0.359	0.023	0.121	0.459
Alcohol consumption (1:no, 2: yes)	-0.147	0.366	0.040	0.807
Karnofsky Performance Status (scoring)	0.154	0.343	-0.102	0.531
ECOG Status (scoring)	-0.182	0.261	0.137	0.401

Table 5: Correlation of scoring of EORTC QLQ-C30 scale and symptomatology scale of EORTC QLQ-H&N43 with postoperative adjuvant therapies

		Quality of Life - Global health status QLQ-C30 (higher levels → better Qol)		**Total Symptomatology QLQ-H&N43 (higher levels→ higher intensity of symptomatology)**	
		mean (std)	p-value	mean (std)	p-value
Adjuvant Radiotherapy	no	68.8 (22.6)	0.987	26.1 (15.1)	0.703
	yes	73.4 (13.9)		29.0 (16.1)	
Adjuvant Chemotherapy	no	71.9 (16.7)	0.728	27.0 (11.3)	0.882
	yes	73.0 (15.3)		29.7 (19.2)	
Physical/ Speech Therapy	no	69.6 (17.1)	0.265	27.4 (17.8)	0.416
	yes	76.4 (13.3)		29.8 (13.0)	

Mann–Whitney test.

Discussion

Tongue cancer has a higher incidence in men and older individuals, but in recent years an upward trend has also been observed in people younger than 40 years [4,5]. These earlier data were supported by the results of this study, as males constituted 70% of our population and the patients' average age was 58.8 years.

The tongue is one of the most challenging organs to rehabilitate because of its important role in swallowing, speaking and protecting the airway [4,18]. The restoration of the tongue depends on its anatomical structure, the size of the deficit, the possible donor areas and their morbidity, the time and the conditions of the patients' recovery, their general physical condition, as well as their expectations, and also affect the patient's postoperative functionality [4,6,19,20].

In the present study, the patients reported chewing and swallowing disorders, mainly involving solid foods, which were usually due to the reduction of the volume and mobility of the tongue, but also to the stiffness of the perioral tissues and muscle atrophy after the radiotherapy. They also reported difficulty during meals in public places. Dzioba et al., in a study of 117 patients with anterior tongue cancer who underwent segmental glossectomy, observed difficulties in swallowing in the first postoperative month, which reverted to preoperative levels six months after surgery [21]. Ihara et al. reported that a sample of 31 patients who underwent glossectomy of more than 50% of the initial tongue volume had greater dysphagia and a higher possibility of aspiration; the investigators also showed that the dysphagia was independent of the reconstruction method [22]. Pyne et al., in a study of 16 patients with tongue cancer who underwent total glossectomy with preservation of the larynx, showed significant deterioration in swallowing (p=0.035) and sensation (p=0.001). Additionally, 53% of patients could not take food per os postoperatively and were fed via a nasogastric tube or gastrostomy [2].

The majority of patients in this study reported speech disturbances, which became more pronounced when they were asked to communicate outdoors, in a noisy environment or on the telephone. Dzioba et al. described impaired speech function in the first and sixth months after completion of treatment, but at 12 months they recorded a return to preoperative levels [21]. Pyne et al., found significant disruption of the articulation of words, but better functional results in the patients who followed physical/ speech therapy sessions postoperatively—a result that was also corroborated in the present research [2].

In the present study, the patients reported the development of xerostomia (oral dryness) and a change in the consistency of saliva, resulting in greater difficulty in speaking and especially in chewing solid foods. This complication was recorded particularly in patients who underwent radiotherapy, where it was caused by radiation damage to the salivary gland parenchyma. In the research of Dzioba et al., severe oral dryness was observed at three months, one year and even five years after the completion of treatment, in patients who underwent radiotherapy. In contrast, patients who were treated exclusively with surgical resection showed no disturbances in either the quality or the quantity of saliva. Patients who received combined radiotherapy and chemotherapy had the worst clinical results. The symptomatology was more intense at six and 12 months, when the patients reported a deficiency and a stickiness in their saliva [21].

The treatment of tongue cancer (surgical or non-surgical) causes a restriction in mouth opening due to the development of fibrous tissue. Dzioba et al. observed restriction in mouth opening postoperatively in all patients, regardless of treatment option (glossectomy alone or with adjuvant therapy). However, patients who underwent combined radiotherapy and chemotherapy showed greater limitations [21].

In the present study, only a small percentage of patients reported postoperative pain in the oral cavity, probably because of the long time elapsed since surgery. This observation agrees with other studies, which reported a decrease in pain during the postoperative follow-up. Skin disorders were found mainly in patients who received radiotherapy, while a small percentage reported disturbances of taste and smell. Dzioba et al. observed similar disturbances in the first postoperative year [21]. In addition, dental problems were observed in the present study, mainly extractions performed as part of the surgical treatment, resulting in further deterioration of masticatory ability.

The present study did not investigate the role of the reconstruction method in the outcome regarding patients' functional status and QoL. Riva et al., in a study involving 22 patients treated with partial glossectomy and adjuvant radiation therapy, reported that the group who underwent reconstruction with primary closure showed better speech outcomes, while rehabilitation with a loco-regional flap (platysma or *pectoralis major* muscle flap) had better results in terms of swallowing [3]. In a study by Ji et al., patients who underwent partial glossectomy and free flap reconstruction had better mobility and speech outcomes than those with primary closure and a reconstructed tongue with less than 50% of the initial volume [23]. Canis et al. used the EORTC QLQ-C30 and EORTC QLQ-H&N35 questionnaires to investigate the contribution of restoration with primary closure or free flaps to the functionality and QoL of 20 patients who underwent glossectomy, and showed the superiority of free flaps in terms of speech, ingestion, and social interactions [24]. In general, there are insufficient research data in the international literature to prove the superiority of any one rehabilitation method over another in terms of functionality and patient QoL [3,24].

In the present study, the patients' functional status scores, assessed with ECOG, were very high, and the vast majority had only mild functional impairment. Higher levels of QoL were found in the cognitive domain and lower levels in relation to social functioning. On the other hand, as regards the intensity of symptoms/items, patients with financial difficulties had the worst QoL. Low scores were recorded for overall symptomatology, with higher values for the patients' fear of disease progression and speaking disorders. Dzioba et al. mentioned that patients returned to preoperative functional levels one year postoperatively, whereas disturbances in the quantity and quality of saliva and limitations in mouth opening persisted [21].

Finally, in the present study, low values of overall health status/ QoL score were associated with high levels of symptomatology, a low educational level and smoking. Furthermore, QoL and symptomatology was not affected by different combinations or individual adjuvant therapies. This is in contrast to Dzioba et al., who reported greater dysphagia and oral dryness in patients who received a postoperative combination of radiotherapy and chemotherapy, compared to those who received only radiotherapy [21].

Limitations

First, it included only a small sample of patients, as a result of the low incidence of tongue cancer in the general population and the exclusion of those who were unable to undergo surgical treatment. In addition, all patients who had completed one-year post-treatment were examined as a whole, without the possibility of classifying them into groups according to the exact time elapsed since surgery. The data collection was carried out using questionnaires completed by the patients themselves. Therefore, the results are based on each patient's subjective perception of how they experienced their QoL and their physical status. Finally, the absence of a standard method and tools for evaluating patients' QoL in the international literature has led to difficulty in drawing overall conclusions and comparisons with other research studies.

Conclusion

Patients who have undergone in glossectomy for tongue cancer experience a variety of physical and psychosocial symptoms, due to the disease and treatment consequences. Further improvement in patients' psychological support is required in order to reduce their fear of disease progression, as well as problems with speech, swallowing and dry mouth. The assessment of patients using self-reported questionnaires allows more comprehensive doctor-patient communication, extending beyond the strict limits of the medical perspective, and also considers the social and psychological side of both disease and treatment.

Submission Declaration and Verification

This study has not been published previously, it is not under consideration for publication elsewhere and its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out. Also, if it accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder.

Conflict of Interest: All authors disclose any financial and personal relationships with other people or organizations that could inappropriately influence (bias) their work.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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