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Quality of life after maxillectomy and prosthetic rehabilitation – a pilot study

Kvalitet života nakon maksilektomije i protetske rehabilitacije: pilot studija

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Abstract

Background/Aim. Although radical surgical treatment is the method of choice in the therapy of cancer of the maxilla and maxillary sinus, it can cause oral dysfunction, social isolation, and emotional and psychological distress, which significantly affects the patient's quality of life (QoL). The aim of the study was to determine the health-related QoL of patients rehabilitated with obturator prosthesis (OP) after maxillectomy, according to demographic and clinical characteristics. **Methods.** The study included 32 patients with a mean age of 63.6 years. The measurement of QoL of patients after maxillectomy and prosthetic rehabilitation was assessed using the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30 (EORTC QLQ-C30) and EORTC QLQ – Head and Neck Cancer Module (QLQ-H&N43). **Results.** Functioning and symptoms were more pronounced in women, younger patients, and single patients ($p < 0.05$). Patients after definitive prosthetics rehabilitation had fewer problems and symptoms compared to patients with surgical and interim OP ($p < 0.05$). Patients with partial obturator dentures had a better perception of function than patients with total dentures ($p < 0.05$). Irradiated patients had more pronounced fatigue, appetite loss, pain in the mouth, dry mouth and sticky saliva, and sense and skin problems compared to nonirradiated patients ($p < 0.05$). **Conclusion.** The results of this study suggest that sex, age, marital status, characteristics of OP, and radiotherapy have a significant impact on QoL in patients after maxillectomy.

Key words:
head and neck neoplasms; maxillofacial prosthesis; oral surgery procedures; quality of life; rehabilitation; surveys and questionnaires.

Apstrakt

Uvod/Cilj. Iako je radikalno hirurško lečenje metod izbora u lečenju tumora gornje vilice i maksilarnih sinusa, ono može dovesti do oralnih disfunkcija, socijalne izolacije, kao i emocionalnog i psihološkog stresa, što značajno utiče na kvalitet života (KŽ) bolesnika. Cilj rada bio je da se ispita KŽ povezan sa zdravljem bolesnika kod kojih je posle maksilektomije primenjena opturator proteza (OP), u odnosu na njihove demografske i kliničke karakteristike. **Metode.** Istraživanjem su obuhvaćena 32 bolesnika, prosečne starosti 63,6 godina. Merenje KŽ bolesnika posle maksilektomije i protetske rehabilitacije vršeno je korišćenjem *European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30* (EORTC QLQ-C30) upitnika i posebnim modulom upitnika za tumore glave i vrata – EORTC QLQ – *Head and Neck Cancer Module* (QLQ-H&N43). **Rezultati.** Poremećaji funkcionisanja i simptomi bili su značajno izraženiji kod žena, mlađih bolesnika i samaca ($p < 0,05$). Nakon rehabilitacije definitivnom opturator protezom (OP), bolesnici su imali manje problema i simptoma u odnosu na bolesnike sa hirurškom ili *interim* OP ($p < 0,05$). Bolesnici sa parcijalnim OP imali su bolju percepciju funkcije u odnosu na bolesnike sa totalnim protezama ($p < 0,05$). Zračeni bolesnici imali su izraženiji umor, gubitak apetita, bol u ustima, suva usta i lepljivu pljuvačku, probleme sa čulima i kožom, u poređenju sa nezračenim bolesnicima ($p < 0,05$). **Zaključak.** Rezultati ovog istraživanja ukazuju na to da pol, starost, bračni status, karakteristike OP i radioterapija imaju značajan uticaj na KŽ bolesnika nakon maksilektomije.

Ključne reči:
glava i vrat, neoplazme; proteze, maksilofacijalne; hirurgija, oralna, procedure; kvalitet života; rehabilitacija; ankete i upitnici.

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Introduction

Head and neck cancer (HNC) accounts for approximately 900,000 cases and over 400,000 deaths annually worldwide [1]. According to the latest available data, in the general population of Serbia, the incidence rate of oral cancer was 6.5/100,000 and from maxillary sinus 0.7/100,000 [2].

The radical surgical procedure is the most frequent treatment for cancer of the maxilla and maxillary sinus. Postsurgical maxillectomy defects can cause oral dysfunction, social isolation, and emotional and psychological distress, which may altogether significantly affect the patient's quality of life (QoL) [3]. Patients need to be able to return to a normal life after maxillectomy without functional impairment or psychological trauma due to aesthetical disfigurement.

Dental rehabilitation is one of the major steps towards the improvement of the QoL after extensive surgical procedures [4]. The use of a prosthetic obturator enables closure of the maxillary defect, separates the oral cavity from the sinonasal cavities, and thus avoids regurgitation [5]. A successful obturator prosthesis (OP) improves speech, mastication, swallowing, and esthetics, which significantly improves the overall well-being of the patient [6–9].

One of the most important parameters in examining the effects of post-treatment follow-up in HNC patients is health-related QoL. Various cross-sectional studies have evaluated the patient's QoL after rehabilitation with OP by using specific questionnaires [4, 10–12].

The most commonly used instruments to assess health-related QoL in patients with HNC are the 30-item Cancer-Quality of Life Questionnaire (QLQ) - QLQ-C30 [13] and 35-item Head and Neck Cancer-QLQ module (QLQ-H&N35) [14], developed by the European Organization for Research and Treatment of Cancer (EORTC). The QLQ-H&N43 questionnaire is a revised and updated version of the QLQ-H&N35. The European Organization for Research and Treatment of Cancer QLQ Core 30 (EORTC QLQ-C30) and the module QLQ-H&N43 instruments have been translated into many languages, including Serbian, and are reliable and valid assessment tools of the QoL of patients with the HNC in multicultural clinical research [15, 16].

To date, the measurement of the QoL in patients with maxillectomy in Serbia has not been given adequate attention. To the best of our knowledge, this is the first study of its kind to investigate the QoL after maxillectomy and prosthetic rehabilitation in HNC patients in the population of Serbia.

The aim of the study was to determine the health-related QoL of patients rehabilitated with OP after maxillectomy according to demographic and clinical characteristics.

Methods

Study design and participants

This retrospective cross-sectional study included patients who underwent surgical maxillectomy and were rehabilitated with OP at the University of Belgrade, Faculty of Dental Medicine, Clinic for Maxillofacial Surgery, Serbia. The study was conducted from October to December 2019. The eligibility criteria of patients included the following: surgical maxillectomy, subsequent rehabilitation treatment with OP, and full completion of the self-reported questionnaire. Exclusion criteria included: recurrent disease, severe comorbidities, free flaps rehabilitation treatment, zygomaticus implant-retained prosthesis, composite occlusal resection (resection of mandible), severe trismus, and noncooperative behavior. Thirty-two patients who met the criteria were analyzed (Figure 1).

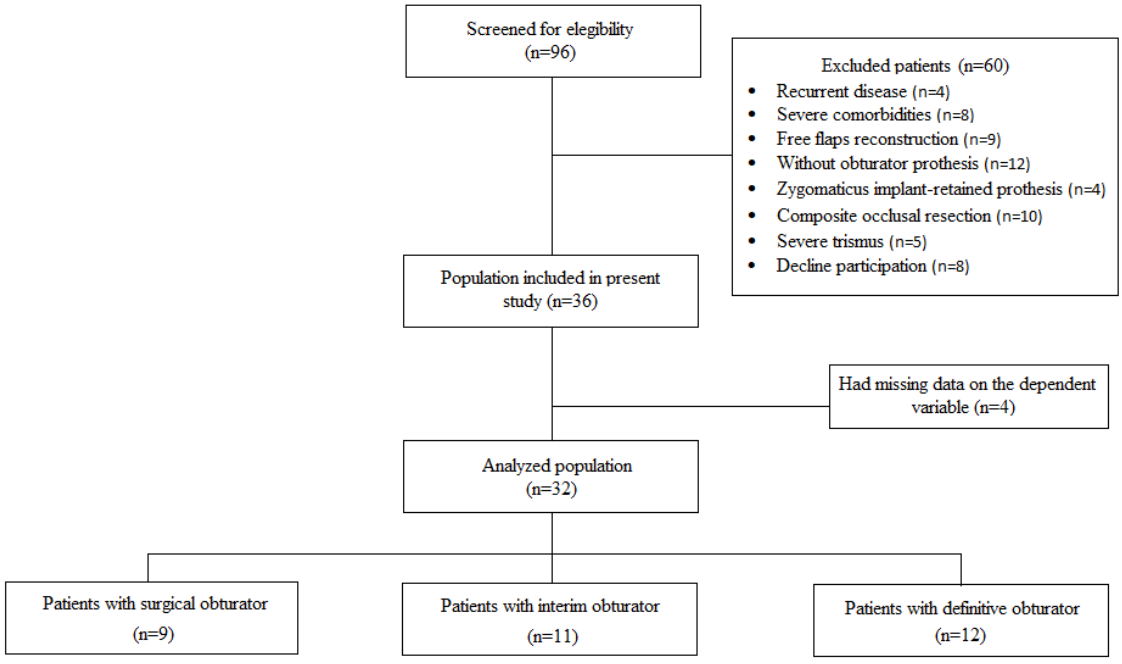

Fig. 1 – Flowchart of participants.

After maxillectomy, patients were rehabilitated with surgical, interim, or definitive OP. The process from surgical treatment to rehabilitation with different types of OP has been previously described by others [7]. For patients who underwent radiation therapy, after the improvement of the general condition, the moment of definitive prosthetic treatment was individually assessed. Assessment of QoL through a questionnaire was evaluated one week after the beginning of wearing and adjusting any type of obturator.

The study was approved by the Ethical Committee of the Faculty of Dental Medicine, University of Belgrade (No. 36/13) and conducted following the Declaration of Helsinki. All patients provided written informed consent to participate in this study.

Instruments

Patients' health-related QoL was assessed individually using EORTC QLQ-C30 (version 3.0) and QLQ-H&N43. The Serbian version was provided by the EORTC group.

The EORTC QLQ-C30 contains 30 questions and includes a single global health/QoL scale scored on a seven-point Likert scale, five functional scales (physical, role, emotional, cognitive, social), three symptom domains (fatigue, nausea/vomiting, pain), and six single items (dyspnea, insomnia, appetite loss, constipation, diarrhea, and financial difficulties) scored on a Likert-like response format (1 – not at all; 2 – a little; 3 – quite a bit; 4 – very much) [16]. Scoring is done according to the EORTC scoring manual [17]. During the scoring procedure, raw EORTC QLQ-C30 scores are linearly transformed into 0–100 scales. In the QLQ-C30 questionnaire, for global health status and the five functioning scales, a high score corresponds to a high QoL. For a symptom scale/items, a higher score implies maximum difficulty or symptom burden.

The QLQ-H&N43 questionnaire consists of 43 questions about the symptoms and side effects of cancer treatment. The questionnaire includes 12-item symptom scales (pain, swallowing, speech problems, senses problems, social eating, problems with teeth, body image, skin problems, sexuality, dry mouth/sticky saliva, shoulder problems, and anxiety) and seven single-item symptom scales (social contact, opening mouth, coughing, lymphedema, weight loss, problems with wound healing, and neurological problems). All items have a four-point Likert scale. All of the multi-item scales and single-item measures range in score from 0 to 100 according to the EORTC scoring manual [15, 16]. In the QLQ-H&N43 questionnaire, a high score represents a high level of difficulties or problems.

A demographic questionnaire was used to collect information about sex, age, marital status, education level, employment, and economic status. Clinical parameters were taken from hospital records and included information about the tumor location, oncological treatment, type of surgical treatment, the time elapsed from maxillectomy to prosthetic rehabilitation, the type of prosthetic obturator reconstruction (surgical, interim, definitive), and the type of definitive OP (total and partial).

Patients were invited to participate in the study during a clinic visit in the order of appearance. The participants filled out questionnaires by themselves. It took 25–30 min on average for each participant to answer the questionnaires. All patients were treated by an experienced maxillofacial prosthodontist who rehabilitates patients with maxillary defects.

Statistical analysis

Several different methods were used to perform the statistical analysis: descriptive summary statistics for the demographic and clinical characteristics and EORTC QLQ-C30 and QLQ-H&N43 scores; parametric (*t*-test) and nonparametric statistic tests (χ^2 and Fisher exact test) for comparison analyses; nonparametric statistics (Mann-Whitney *U* test). A statistical significance was set at $p < 0.05$. Software package SPSS 22 was used for the analyses (SPSS inc, Chicago, IL, USA).

Results

Of the 96 patients with maxillectomy, the remaining 32 patients with surgical, interim, or definitive OP who met all criteria and completed the questionnaire entirely were analyzed.

Demographic and clinical parameters are presented in Table 1. The results have shown that the patients were predominantly in partnerships or marital unions, with completed secondary education, retired, and of average economic status. The primary localization of the tumor was the maxillary alveolus, hard palate, and maxillary sinus. Most of the patients were treated with surgery (predominantly with partial maxillectomy) and postoperative radiotherapy. The time elapsed from maxillectomy to prosthetic rehabilitation and the type of OP (total/partial) are presented in Table 1.

There was no statistically significant difference in QoL compared to education, employment, and economic status. The average score value of different scales for EORTC QLQ-C30 and QLQ-H&N43 according to sex, age, and marital status (single vs. partnership/marriage) is given in Table 2. The functioning scale with the lowest average score in both sexes was global health status. Women had significantly worse scores in emotional functioning and felt more pronounced symptoms such as fatigue, insomnia, and appetite loss ($p < 0.05$) ($p = 0.016$, $p = 0.027$, $p = 0.032$, respectively). The men were most affected in terms of social functioning, financial difficulties, and sexuality problems ($p < 0.05$) ($p = 0.045$, $p = 0.004$, $p = 0.024$, respectively).

Younger patients had higher values for global health status but without statistical significance. The emotional and social functioning in patients under 60 years of age was significantly lower than in patients over the age of 60 ($p < 0.05$) ($p = 0.038$ and $p = 0.034$, respectively). Dominant symptoms in the in patients over the age of 60 were speech problems, problems with social eating, sexuality, and social contact ($p < 0.05$) ($p = 0.022$, $p = 0.036$, $p = 0.016$, $p = 0.043$, respectively) (Table 2).

Table 1

Demographic and clinical characteristics

Characteristics	Patients (n = 32)
Gender	
male	19 (59.4)
female	13 (40.6)
Age (years)	63.6 (44–83)
Marital status	
married/partner	19 (59.4)
divorced	5 (15.6)
widowed	8 (25.0)
Education level	
no formal education	3 (9.4)
primary school	7 (21.8)
secondary school	17 (53.2)
university	5 (15.6)
Employment status	
employed	8 (25.0)
unemployed	4 (12.5)
retired	20 (62.5)
Economic status	
good	5 (15.6)
moderate	14 (43.8)
bad	10 (31.3)
very bad	3 (9.3)
Localization	
maxillary alveolus	13 (40.6)
hard palate	8 (25.0)
maxillary sinus/nasal cavity	11 (34.4)
Treatment	
surgery only	14 (43.8)
surgery + radiotherapy	12 (37.5)
surgery + chemotherapy	4 (12.4)
surgery + radiotherapy + chemotherapy	2 (6.3)
Surgical procedure	
partial maxillectomy	22 (68.8)
subtotal maxillectomy	4 (12.5)
total maxillectomy	6 (18.7)
Time elapsed from maxillectomy and prosthetic rehabilitation	
surgical obturator prostheses (days)	4.3 ± 2.2
interim obturator prostheses (weeks)	3.2 ± 1.3
definitive obturator prostheses	
nonirradiated patients (weeks)	8.5 ± 2.5
irradiated patients (months)	22.4 ± 10.7
Type of obturator prostheses	
total denture	14 (43.8)
partial denture	18 (56.2)

All results are expressed as numbers (percentages) except age and time elapsed from maxillectomy and prosthetic rehabilitation which are expressed as median (range) and mean ± standard deviation, respectively.

The global health status was slightly higher in patients who were married or in partnership but without statistical significance. The single patients had lower scores in all functioning scales, but the physical functioning was statistically significantly lower as compared to patients with the "in marriage/partnership" status ($p < 0.05$) ($p = 0.042$). Among the symptoms, fatigue and financial problems were significantly compromised in single patients than in those living in a marital or partnership union ($p < 0.05$) ($p = 0.025$ and $p = 0.027$, respectively) (Table 2).

The average score value of different scales for EORTC QLQ-C30 and QLQ-H&N43 according to the type of OP, denture, and treatment are given in Table 3. Regardless of the type of prosthesis, the functioning scale with the lowest average score was global health status, while functioning scales with the highest scores were observed in the cognitive, physical, and role domains. The highest value for global health status was in patients with definitive obturators compared to patients with surgical and interim obturators but without statistical significance. Significant differences were observed in the fatigue, insomnia, constipation, appetite loss, dry mouth, speech problems, and social eating domains in patients with surgical OPs compared to patients with definitive OP ($p < 0.05$) ($p = 0.002$, $p = 0.028$, $p = 0.021$,

Table 2

The average score value of EORTC QLQ-C30 and QLQ-H&N43 according to age, sex, and living arrangements

Scale/items	Gender		*p*	Age (years)		*p*	Marital status		*p*
	male	female		< 60	> 60		single	marriage/ partnership	
EORTC QLQ-C30									
global health status	53.2 ± 17.3	48.7 ± 23.7	0.209	54.4 ± 21.2	45.6 ± 25.3	0.426	47.5 ± 23.6	51.2 ± 17.3	0.309
physical functioning	80.3 ± 30.4	73.8 ± 25.9	0.221	73.5 ± 18.4	67.3 ± 27.5	0.432	77.8 ± 26.5	90.1 ± 34.3	0.042*
role functioning	81.5 ± 24.3	76.7 ± 21.1	0.584	70.4 ± 27.9	77.9 ± 30.7	0.235	70.1 ± 28.4	83.8 ± 29.9	0.884
emotional functioning	68.3 ± 23.4	52.3 ± 24.3	0.037*	62.8 ± 29.6	80.9 ± 21.9	0.038*	58.7 ± 18.6	62.3 ± 23.5	0.056
cognitive functioning	74.2 ± 19.9	77.4 ± 18.5	0.869	70.9 ± 21.6	68.1 ± 22.7	0.863	64.6 ± 25.7	67.9 ± 27.3	0.534
social functioning	62.2 ± 27.3	75.3 ± 26.2	0.045*	66.3 ± 29.8	77.4 ± 26.6	0.034*	61.9 ± 19.8	75.4 ± 30.8	0.654
fatigue	27.2 ± 10.8	42.1 ± 17.3	0.016*	24.5 ± 21.6	29.3 ± 28.6	0.842	41.4 ± 15.8	20.3 ± 2.7	0.025*
nausea and vomiting	7.5 ± 7.2	5.4 ± 2.3	0.653	2.1 ± 2.0	3.5 ± 3.3	0.342	6.3 ± 5.3	8.1 ± 7.5	0.520
pain	22.1 ± 17.5	13.2 ± 11.2	0.368	13.7 ± 11.3	20.9 ± 17.8	0.345	21.7 ± 15.7	27.4 ± 17.9	0.169
dyspnea	11.8 ± 9.7	3.5 ± 3.3	0.126	6.9 ± 5.8	3.8 ± 3.3	0.431	4.5 ± 3.3	6.3 ± 5.2	0.828
insomnia	14.7 ± 12.1	33.3 ± 10.5	0.027*	28.1 ± 17.3	23.6 ± 10.4	0.452	21.6 ± 10.7	22.4 ± 21.6	0.279
appetite loss	16.7 ± 22.4	32.6 ± 21.7	0.032*	33.2 ± 15.6	20.9 ± 17.5	0.356	24.8 ± 21.3	13.3 ± 9.9	0.519
constipation	9.8 ± 7.6	16.0 ± 7.3	0.350	14.3 ± 13.6	7.5 ± 6.9	0.534	5.4 ± 4.5	3.9 ± 2.3	0.851
diarrhea	9.3 ± 5.3	11.1 ± 10.1	0.605	13.6 ± 10.5	7.2 ± 6.4	0.438	16.8 ± 5.5	17.6 ± 11.5	0.719
financial difficulties	47.9 ± 26.3	20.4 ± 19.6	0.004*	30.7 ± 10.7	36.4 ± 29.3	0.137	44.9 ± 19.1	23.4 ± 17.4	0.027*
EORTC QLQ-H&N43									
pain in the mouth	18.4 ± 21.0	28.4 ± 24.3	0.105	4.2 ± 5.9	13.9 ± 12.7	0.234	21.9 ± 20.1	18.3 ± 14.4	0.272
swallowing	22.7 ± 25.9	22.5 ± 19.3	0.978	16.7 ± 23.6	16.8 ± 15.7	0.395	23.7 ± 22.6	16.7 ± 28.9	0.346
problems with teeth	23.4 ± 26.6	33.3 ± 29.5	0.128	16.7 ± 23.6	3.7 ± 6.4	0.527	28.6 ± 26.8	19.1 ± 17.2	0.375
dry mouth and sticky saliva	23.6 ± 29.0	29.0 ± 29.4	0.489	15.0 ± 35.3	5.6 ± 9.6	0.382	21.9 ± 24.2	26.7 ± 16.7	0.436
senses problems	15.5 ± 24.8	16.0 ± 27.5	0.940	12.2 ± 10.3	22.1 ± 19.3	0.253	20.2 ± 31.7	27.8 ± 48.1	0.732
speech problems	20.0 ± 26.3	25.2 ± 21.9	0.429	43.2 ± 4.2	25.6 ± 13.4	0.022*	28.4 ± 26.5	25.1 ± .19.9	0.138
body image	26.4 ± 26.5	26.3 ± 24.7	0.988	33.3 ± 26.2	20.2 ± 38.5	0.052	36.8 ± 26.2	33.3 ± 48.4	0.680
social eating	25.3 ± 22.9	35.5 ± 29.1	0.148	37.5 ± 53.0	22.2 ± 21.0	0.036*	33.3 ± 32.2	29.7 ± 14.4	0.159
sexuality	45.9 ± 27.4	28.6 ± 18.2	0.024*	41.7 ± 16.7	16.7 ± 16.7	0.016*	37.4 ± 16.6	43.6 ± 41.9	0.529
shoulder problems	6.3 ± 16.9	11.1 ± 18.5	0.316	18.0 ± 19.4	5.6 ± 9.6	0.373	14.0 ± 19.5	18.4 ± 17.6	0.503
skin problem	6.9 ± 15.5	9.9 ± 14.6	0.463	5.6 ± 7.9	8.3 ± 9.5	0.314	8.7 ± 5.7	3.7 ± 2.4	0.516
anxiety	45.9 ± 32.0	43.5 ± 32.4	0.136	25.7 ± 17.1	22.2 ± 19.5	0.641	43.0 ± 35.7	44.4 ± 38.5	0.149
problems opening mouth	16.1 ± 26.2	25.9 ± 32.5	0.216	28.3 ± 28.6	32.4 ± 24.3	0.531	26.3 ± 30.6	18.1 ± 19.2	0.452
coughing	14.9 ± 21.1	17.3 ± 26.7	0.716	16.7 ± 23.6	15.1 ± 14.1	0.825	14.0 ± 23.1	17.0 ± 13.2	0.861
social contact	33.3 ± 36.7	48.1 ± 32.5	0.117	36.7 ± 23.6	22.2 ± 18.2	0.043*	40.3 ± 30.6	45.6 ± 28.9	0.487
swelling in the neck	1.1 ± 6.2	6.2 ± 16.1	0.124	9.7 ± 9.2	13.7 ± 10.2	0.323	3.5 ± 2.3	6.1 ± 5.2	0.328
weight loss	27.6 ± 25.3	19.7 ± 24.9	0.249	37.0 ± 23.6	29.3 ± 18.3	0.314	23.6 ± 14.4	22.2 ± 19.2	0.156
problem with wound healing	2.3 ± 12.4	7.4 ± 19.3	0.239	7.6 ± 5.3	8.5 ± 6.8	0.682	10.5 ± 22.4	12.2 ± 13.3	0.887
neurological problems	5.7 ± 18.0	11.1 ± 25.0	0.123	8.2 ± 6.3	9.3 ± 5.6	0.538	14.0 ± 11.6	11.7 ± 10.4	0.571

EORTC QLQ-C30 – European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire (QLQ) Core 30; QLQ-H&N43 – EORTC QLQ Head and Neck Module.
All results are expressed as mean ± standard deviation. *$p < 0.05$.

$p = 0.048$, $p = 0.042$, $p = 0.013$, $p = 0.035$, respectively). Further, a significant difference between QoL with surgical OPs and QoL with interim OPs was found only in constipation ($p < 0.05$) ($p = 0.034$). A significant difference between QoL with interim OP and QoL with definitive OPs was found in speech problems, social eating, skin problems, and social contact domain ($p < 0.05$) ($p = 0.013$, $p = 0.035$, $p = 0.032$, $p = 0.016$, respectively).

In case all maxillary teeth were missing, the OP was made with all teeth, while in the presence of the remaining teeth, the denture would compensate for the missing teeth. Patients with definitive total denture had more pronounced symptoms such as problems with swallowing, senses, speech, social eating, and social contact compared to patients with a partial denture ($p < 0.05$) ($p = 0.026$, $p = 0.016$, $p = 0.037$, $p = 0.041$, $p = 0.043$, respectively).

In relation to using radiation therapy, patients in whom radiotherapy was used had a worse perception of global health status and all functional scales but without statistical significance. Irradiated patients had more pronounced symptoms such as fatigue, appetite loss, pain in the mouth, dry mouth and sticky saliva, and sense and skin problems compared to nonirradiated patients ($p < 0.05$) ($p = 0.014$, $p = 0.002$, $p = 0.018$, $p = 0.010$, $p = 0.002$, $p = 0.001$, respectively).

Discussion

Postsurgical maxillary defects predispose the patient to have several functional, emotional, and social problems. Studies have shown that clinicians miss up to half of the self-reported subjective toxicities reported by patients with canc-

Table 3

The average score value of EORTC QLQ-C30 and QLQ-H&N43 according to the type of obturator prosthesis, denture, and treatment

Scale/items	Type of obturator prostheses								Treatment		
	surgical	interim	definitive	*p*	Sig. time interval	total denture	partial denture	*p*	irradiated	nonirradiated	*p*
EORTC QLQ-C30											
global health status	42.7 ± 19.5	52.6 ± 20.5	60.8 ± 18.2	0.092		52.3 ± 23.8	65.7 ± 29.7	0.318	56.8 ± 15.4	64.2 ± 20.5	0.124
physical functioning	64.3 ± 19.6	72.3 ± 18.7	76.6 ± 19.2	0.085		61.4 ± 25.2	75.5 ± 23.6	0.366	62.1 ± 18.5	77.3 ± 19.9	0.079
role functioning	68.8 ± 25.3	71.7 ± 22.5	77.9 ± 18.2	0.204		69.4 ± 29.4	72.9 ± 19.5	0.291	73.8 ± 26.3	79.8 ± 21.2	0.137
emotional functioning	61.9 ± 25.6	61.4 ± 25.2	65.7 ± 19.6	0.336		64.8 ± 26.8	66.4 ± 21.0	0.153	61.7 ± 22.6	68.9 ± 19.6	0.098
cognitive functioning	76.8 ± 13.6	77.6 ± 17.1	79.6 ± 19.8	0.447		71.3 ± 25.2	76.8 ± 24.6	0.239	76.7 ± 18.6	79.8 ± 23.7	0.328
social functioning	63.7 ± 25.6	67.2 ± 24.6	75.0 ± 19.7	0.135		72.8 ± 23.2	75.6 ± 22.6	0.241	73.7 ± 23.6	76.7 ± 22.3	0.268
fatigue	41.9 ± 25.7	31.8 ± 19.6	24.2 ± 26.5	0.002*	S/D	21.2 ± 21.7	26.5 ± 21.6	0.248	43.9 ± 22.1	27.1 ± 19.7	0.014*
nausea and vomiting	12.7 ± 19.2	9.7 ± 11.7	6.7 ± 10.4	0.114		12.7 ± 12.4	9.5 ± 5.3	0.138	14.7 ± 12.1	13.8 ± 10.2	0.257
pain	25.3 ± 26.1	17.8 ± 18.4	13.6 ± 15.8	0.097		13.8 ± 12.6	14.6 ± 13.6	0.362	24.3 ± 22.3	32.3 ± 26.1	0.168
dyspnea	13.1 ± 21.5	11.3 ± 19.5	6.9 ± 11.9	0.069		9.5 ± 7.1	9.2 ± 4.8	0.424	8.9 ± 15.5	6.1 ± 10.3	0.325
insomnia	30.0 ± 33.6	18.2 ± 24.7	8.9 ± 15.1	0.028*	S/D	19.1 ± 20.2	17.3 ± 14.6	0.162	10.0 ± 11.6	8.9 ± 15.1	0.174
appetite loss	32.9 ± 26.7	25.0 ± 26.1	14.5 ± 21.8	0.021*	S/D	12.2 ± 8.5	8.8 ± 9.4	0.247	16.9 ± 16.7	13.5 ± 21.7	0.002*
constipation	25.6 ± 32.4	12.7 ± 13.2	5.6 ± 8.4	0.034*	S/I, S/D 0.048	10.6 ± 6.5	7.6 ± 7.2	0.243	8.6 ± 9.4	6.6 ± 7.5	0.185
diarrhea	13.5 ± 17.8	8.2 ± 11.0	4.5 ± 8.4	0.057		9.4 ± 9.1	8.1 ± 5.3	0.384	6.3 ± 5.6	4.8 ± 5.4	0.236
financial difficulties	35.4 ± 39.8	42.5 ± 42.2	37.6 ± 39.1	0.859		35.6 ± 21.5	34.1 ± 30.1	0.162	38.8 ± 22.3	37.7 ± 35.1	0.291
EORTC QLQ-H&N43											
pain in the mouth	24.7 ± 29.8	19.8 ± 19.9	12.9 ± 13.2	0.069		19.2 ± 15.2	18.1 ± 14.2	0.536	21.8 ± 13.6	4.2 ± 5.8	0.018*
swallowing	34.1 ± 35.2	21.3 ± 25.3	25.0 ± 25.8	0.156		29.2 ± 12.9	17.0 ± 11.8	0.026*	19.7 ± 18.3	6.0 ± 5.7	0.131
problems with teeth	24.1 ± 19.9	22.5 ± 25.5	21.4 ± 23.9	0.679		23.4 ± 20.4	28.2 ± 21.6	0.186	20.9 ± 15.7	21.4 ± 23.2	0.252
dry mouth and sticky saliva	37.5 ± 39.6	26 ± 29.2	18.5 ± 19.6	0.042*	S/D	25.2 ± 20.3	22.5 ± 19.2	0.266	31.6 ± 28.6	12.7 ± 13.5	0.010*
senses problems	9.7 ± 13.1	12.5 ± 15.5	11.6 ± 13.5	0.944		21.5 ± 18.7	12.1 ± 10.4	0.016*	45.6 ± 23.5	13.3 ± 16.2	0.002*
speech problems	67.3 ± 25.6	51.1 ± 20.2	30.9 ± 17.6	0.013*	S/D, I/D 0.016	39.4 ± 21.5	29.9 ± 19.7	0.037*	33.1 ± 25.6	30.7 ± 18.5	0.337
body image	16.2 ± 15.9	19.4 ± 17.1	14.3 ± 20.2	0.203		17.3 ± 12.4	15.3 ± 9.5	0.472	25.0 ± 18.6	17.3 ± 19.1	0.168
social eating	42.2 ± 45.6	48.6 ± 42.5	21.1 ± 22.9	0.035*	S/D, I/D 0.026	38.7 ± 32.1	27.7 ± 29.5	0.041*	24.9 ± 26.8	20.1 ± 21.5	0.238
sexuality	17.6 ± 23.6	21.7 ± 29.8	10.6 ± 15.3	0.558		19.2 ± 18.4	19.8 ± 20.8	0.482	15.6 ± 12.4	10.7 ± 9.3	0.469
shoulder problems	8.7 ± 12.2	13.5 ± 16.0	12.6 ± 13.9	0.823		11.6 ± 10.7	12.2 ± 11.9	0.211	18.3 ± 18.1	13.6 ± 11.2	0.275
skin problem	29.5 ± 32.4	41.2 ± 22.3	18.5 ± 23.4	0.032*	I/D 0.039	17.5 ± 13.5	15.6 ± 10.4	0.325	43.8 ± 22.1	19.3 ± 20.2	0.001**
anxiety	37.6 ± 29.4	27.6 ± 30.9	22.6 ± 28.8	0.532		24.6 ± 18.6	25.0 ± 13.8	0.357	24.9 ± 22.4	20.6 ± 20.2	0.239
problems opening mouth	34.0 ± 28.4	38.7 ± 39.5	30.2 ± 17.8	0.568		28.2 ± 28.6	26.2 ± 25.3	0.423	33.8 ± 23.6	28.2 ± 23.4	0.362
coughing	23.2 ± 27.5	18.5 ± 21.1	9.3 ± 15.2	0.478		11.3 ± 10.2	10.5 ± 9.2	0.123	13.7 ± 6.3	8.9 ± 11.8	0.628
social contact	29.4 ± 25.8	32.9 ± 13.5	11.1 ± 10.5	0.016*	I/D	29.6 ± 30.6	17.6 ± 15.7	0.043*	17.9 ± 16.7	12.1 ± 10.2	0.357
swelling in the neck	10.4 ± 13.5	8.5 ± 10.4	8.4 ± 11.2	0.432		5.4 ± 4.3	5.6 ± 5.2	0.226	8.7 ± 6.3	8.9 ± 9.4	0.507
weight loss	67.2 ± 53.7	57.2 ± 51.3	35.3 ± 41.5	0.124		24.2 ± 23.1	20.6 ± 20.1	0.256	37.3 ± 28.6	32.3 ± 25.7	0.284
problems with wound healing	5.7 ± 3.4	4.1 ± 4.5	3.2 ± 3.6	0.342		3.0 ± 2.6	4.2 ± 3.7	0.327	4.1 ± 3.9	3.4 ± 2.6	0.403
neurological problems	8.7 ± 10.5	10 ± 9.5	8.5 ± 8.2	0.235		8.4 ± 8.5	8.9 ± 9.5	0.227	10.2 ± 9.6	7.2 ± 5.7	0.324

EORTC QLQ-C30 – European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire (QLQ) Core 30; QLQ-H&N43 – EORTC QLQ Head and Neck Module; S – surgical obturator; I – interim obturator; D – definitive obturator. All results are expressed as mean ± standard deviation. *$p < 0.05$; **$p < 0.01$.

er [18]. Therefore, research on the QoL of patients with maxillectomy would help healthcare professionals to better inform patients about possible implications, risks, and benefits after maxillectomy.

Even though a large number of studies have investigated QoL after treatment for malignant cancer in the face region, the number of studies dealing with the QoL of patients after maxillectomy and OP rehabilitation is limited [9]. The EORTC QLQ-C30 and QLQ-H&N43 are well-established questionnaires for measuring the HNC patient's perception of problems and well-being [15].

It is reported that the female patients showed significantly lower global health status after maxillectomy and rehabilitation with OPs compared to male patients [12]. Similarly, in our subjects, from all functioning scales, the lowest score, in both sexes, was the global health status, which was more pronounced in females.

HNC has been described as one of the most emotionally traumatic types of cancer that can lead to increased levels of anxiety and depression [19, 20]. In our report, female respondents had significantly worse scores in emotional functioning, which is in accordance with the other analyzed reports [14]. Similar to the findings of previous studies, it appeared that women had more pronounced symptoms such as fatigue, insomnia, and appetite loss in the study presented [8, 9, 21].

Male respondents had the lowest score in social functioning, which indicates that the disease and treatment have significantly affected family relationships and relationships with other people. Furthermore, our results have shown a higher rate of financial and sexual problems in male participants, a finding similar to those of previous studies in patients with oral cancer [20, 22].

The study has shown that older cancer patients experience less distress related to cancer treatment as compared to younger patients and that there is an inverse relationship between age and psychological distress after rehabilitation [8, 23]. In the current study, younger patients had worse QoL in many aspects compared to older patients, a finding similar to those of previous studies [9, 23]. This can be explained by the fact that older patients better accept age-related physical illness due to the natural course of life and comorbidity associated with advancing age. Likewise, younger patients are not well prepared for serious illnesses and may feel that their life span has been shortened and their QoL disturbed because of the disease [23, 24]. Some other authors have come to the opposite results and reported that younger patients had better QoL after maxillectomy and rehabilitation with OP [11, 12].

Previous investigations have acknowledged that the presence of caring family members, socioeconomic advantages, and community life may contribute to a better perception of QoL [8]. In this study, the singles were more compromised in physical functioning, fatigue, and financial difficulties. The study has shown that a companionless lifestyle, which is associated with social isolation and increased depression and anxiety, can cause worse physical or emotional fatigue [12]. In addition to the burden of the basic disease, the lack of assistance in daily obligations

significantly physically burdens patients who live alone. Moreover, the socioeconomic aspect of life in partnership makes it easier for patients to overcome the economic problems caused by the disease, especially in developing countries.

Studies reported that HNC patients have enormous problems before dental rehabilitation [3, 5]. Some authors reported certain improvements in oral functions: chewing, swallowing, mouth opening, speech, orofacial appearance, and social interaction after prosthetic rehabilitation with definitive OP [7, 8, 25, 26]. Assessments with the EORTC QLQ-C30 questionnaire showed discreet improvements in all functional scales during rehabilitation. The QoL parameters vary depending on the type of OP. The global health status in the EORTC QLQ-C30 was the best rated in patients with definitive obturators compared to patients with surgical and interim obturators, which is in accordance with a recent study [27].

The following difficulties have been reported as the most common problems that occur after the invasive maxillectomy procedure: difficulties in social and physical contact with others, public appearance, communications with people either directly or by telephone, as well as dining in front of family members and other people [23]. The surgical obturator does not have the best obturation characteristics, which leads to nasal regurgitation and problems with speech and eating [27]. That was the reason for the high expression of dry mouth, problems with speech, social eating, and loss of appetite in patients with surgical obturators in relation to the condition after definitive rehabilitation. Fatigue and insomnia were also dominant side effects in patients with surgical obturators compared to other expected side effects. That has already been confirmed in other patients with HNC immediately after surgical treatment [28]. Another dominant symptom in the early phase of rehabilitation is constipation which can be attributed to previous interventions and difficulties in food intake [29].

Prosthetic rehabilitation of surgically treated cancer of the maxilla and maxillary sinus is completed by making a definitive OP. In our study, the wide range of time periods for definitive prosthetic treatment may be due to the different duration of pronounced side effects of radiation and the time required for the improvement of the general condition. Several studies reported that function and symptoms after definitive rehabilitation return to the level from before the surgical intervention [8, 27]. Our results indicate significant improvement in functioning and symptoms after definitive prosthetic rehabilitation, especially in patients who have some of their own teeth, compared to patients with total obturator dentures or in stage with surgical or interim OP. That is in agreement with other reports because lack of teeth makes speech and mastication difficult [8, 23, 27].

The more pronounced symptoms have been observed among irradiated patients. Problems with the senses, dry mouth, and skin are a direct consequence of radiotherapy, as confirmed in other studies [10, 30].

There are several limitations in this study that should be acknowledged. First, the sample size of this study was relatively small and was carried out in a single medical center, which is why the results should be viewed as preliminary; therefore, further research is needed.

In addition, the limitation of this study is the fact that it does not represent temporal changes in QoL from the moment of obtaining the surgical obturator to final reconstruction with definitive obturators; instead, the study shows QoL in different patients. The additional disadvantages were the lack of data on preoperative QoL assessment, size, and classification of the postoperative defect and occlusion characteristics before prosthetic rehabilitation. Finally, participants restored with implant-retained OPs were excluded from this study.

So far, the investigation of QoL in the Serbian population with malignant tumors in the head and neck region has been already implemented [15, 20, 31]. However, this study is, to the best of our knowledge, the first to investigate the health-related QoL in this population after prosthetic rehabilitation.

Conclusion

The results of this study suggest that sex, age, marital status, and irradiation therapy had a significant impact on QoL. Furthermore, the definitive prosthetics rehabilitation with partial denture significantly improves QoL in patients after maxillectomy. Using this QoL questionnaire in clinical practice would help healthcare professionals understand the impact that the disease and its treatment have on patients' lives. Still, there is a further need for a prospective longitudinal trial with a larger sample to identify predictors of QoL in patients with maxillary defects after rehabilitation.

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REFERENCES

1. *World Health Organization*. Global Cancer Observatory. Paris, France: International Agency for Research on Cancer. Available from: https://gco.iarc.fr/ [accessed 2021 October 6].
2. *Institute of Public Health of Serbia Dr. Milan Jovanovic- Batut*. Center for prevention and control of noncommunicable diseases. Cancer incidence and mortality in central Serbia 2015. Belgrade: Cancer Registry of Central Serbia 2015.
3. *Valdez JA, Brennan MT*. Impact of Oral Cancer on Quality of Life. Dent Clin North Am 2018; 62(1): 143–54.
4. *Dholam KP, Dugad JA, Sadashiva KM*. Impact of oral rehabilitation on patients with head and neck cancer: A study using the Liverpool Oral Rehabilitation Questionnaire and the Oral Health Impact Profile-14. J Prosthet Dent 2017; 117(4): 559–62.
5. *Keyf F*. Obturator prostheses for hemimaxillectomy patients. J Oral Rehabil 2001; 28(9): 821–9.
6. *Seignemartin CP, Miranda ME, Luz JG, Teixeira RG*. Understandability of Speech Predicts Quality of Life Among Maxil-

lectomy Patients Restored With Obturator Prosthesis. J Oral Maxillofac Surg 2015; 73(10): 2040–8.
7. *Dalkiz M, Dalkiz AS*. The Effect of Immediate Obturator Reconstruction after Radical Maxillary Resections on Speech and Other Functions. Dent J (Basel) 2018; 6(3): 22.
8. *Depprich R, Naujoks C, Lind D, Ommerborn M, Meyer U, Kübler NR*, et al. Evaluation of the quality of life of patients with maxillofacial defects after prosthodontic therapy with obturator prostheses. Int J Oral Maxillofac Surg 2011; 40(1): 71–9.
9. *Ali MM, Khalifa N, Alhajj MN*. Quality of life and problems associated with obturators of patients with maxillectomies. Head Face Med 2018; 14(1): 2.
10. *Chigurupati R, Aloor N, Salas R, Schmidt BL*. Quality of life after maxillectomy and prosthetic obturator rehabilitation. J Oral Maxillofac Surg 2013; 71(8): 1471–8.
11. *Chen C, Ren WH, Huang RZ, Gao L, Hu ZP, Zhang LM,* et al. Quality of Life in Patients After Maxillectomy and Placement of Prosthetic Obturator. Int J Prosthodont 2016; 29(4): 363–8.
12. *Artopoulou II, Karademas EC, Papadogeorgakis N, Papathanasiou I, Polyzois G*. Effects of sociodemographic, treatment variables, and medical characteristics on quality of life of patients with maxillectomy restored with obturator prostheses. J Prosthet Dent 2017; 118(6): 783–9. e4.
13. *Aaronson NK, Ahmedzai S, Bergman B, Bullinger M, Cull A, Duez NJ,* et al. The European Organization for Research and Treatment of Cancer QLQ-C30: a quality-of-life instrument for use in international clinical trials in oncology. Journal of the National Cancer Institute 1993; 85(5): 365–76.
14. *Bjordal K, de Graeff A, Fayers PM, Hammerlid E, van Pottelsberghe C, Curran D,* et al. A 12 country field study of the EORTC QLQ-C30 (version 3.0) and the head and neck cancer specific module (EORTC QLQ-H&N35) in head and neck patients. EORTC quality of life group. Eur J Cancer 2000; 36(14): 1796–807.
15. *Trivic S, Trivic A, Singer S, Milovanovic J, Stankovic P, Mikic A,* et al. European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Head and Neck Module, updated version: Preliminary psychometric data from Serbian laryngectomized patients. Head Neck 2016; 38(1): 916–24.
16. *Singer S, Amdal CD, Hammerlid E, Tomaszewska IM, Castro Silva J, Mehanna H,* et al. EORTC Quality of Life and the EORTC Head and Neck Cancer Groups. International validation of the revised European Organisation for Research and Treatment of Cancer Head and Neck Cancer Module, the EORTC QLQ-HN43: Phase IV. Head Neck 2019; 41(6): 1725–37.
17. *Fayers PM, Aaronson NK, Bjordal K, Groenvold M, Curran D, Bottomley A*. EORTC QLQ-C30 Scoring Manual (3rd Edition). Brussels: European Organisation for Research and Treatment of Cancer; 2001.
18. *Di Maio M, Gallo C, Leighl NB, Piccirillo MC, Daniele G, Nuzzo F,* et al. Symptomatic toxicities experienced during anticancer treatment: agreement between patient and physician reporting in three randomized trials. J Clin Oncol 2015; 33(8): 910–5.
19. *Wu YS, Lin PY, Chien CY, Fang FM, Chiu NM, Hung CF,* et al. Anxiety and depression in patients with head and neck cancer: 6-month follow-up study. Neuropsychiatr Dis Treat 2016; 12: 1029–36.
20. *Maciejewski O, Smeets R, Gerhards F, Kolk A, Kloss F, Stein JM,* et al. Gender specific quality of life in patients with oral squamous cell carcinomas. Head Face Med 2010; 6: 21.
21. *Milovanović J, Andrejić D, Jotić A, Đukić V, Tošković O, Savić-Vujović K,* et al. The impact of socioeconomic factors on quality of life and functional impairment in patients treated for oropharyngeal carcinoma. Vojnosanit Pregl 2019; 76(6): 598–606.
22. *López-Jornet P, Camacho-Alonso F, López-Tortosa J, Palazon Tovar T, Rodríguez-Gonzales MA*. Assessing quality of life in patients with head and neck cancer in Spain by means of EORTC QLQ-C30 and QLQ-H&N35. J Craniomaxillofac Surg 2012; 40(7): 614–20.
23. *Kumar P, Alvi HA, Rao J, Singh BP, Jurel SK, Kumar L,* et al. Assessment of the quality of life in maxillectomy patients: A longitudinal study. J Adv Prosthodont 2013; 5(1): 29–35.
24. *Laraway DC, Lakshmiah R, Lowe D, Roe B, Rogers SN*. Quality of life in older people with oral cancer. Br J Oral Maxillofac Surg 2012; 50(8): 715–20.
25. *Dholam K, Chouksey G, Dugad J*. Impact of Oral Rehabilitation on Patients with Head and Neck Cancer: Study of 100 Patients with Liverpool Oral Rehabilitation Questionnaire and the Oral Health Impact Profile. Indian J Otolaryngol Head Neck Surg 2020; 72(3): 308–12.
26. *Vero N, Mishra N, Singh BP, Singh K, Jurel SK, Kumar V*. Assessment of swallowing and masticatory performance in obturator wearers: a clinical study. J Adv Prosthodont 2015; 7(1): 8–14.
27. *Dholam KP, Bachher G, Gurav SV*. Changes in the quality of life and acoustic speech parameters of patients in various stages of prosthetic rehabilitation with an obturator after maxillectomy. J Prosthet Dent 2020; 123(2): 355–63.
28. *Shuman AG, Duffy SA, Ronis DL, Garetz SL, McLean SA, Fowler KE,* et al. Predictors of poor sleep quality among head and neck cancer patients. Laryngoscope 2010; 120(6): 1166–72.
29. *Şirin G, Şirin S*. Functional constipation as a neglected condition in laryngectomized patients. Turk J Gastroenterol 2020; 31(2): 120–7.
30. *do Nascimento Santos Lima E, Ferreira IB, Lajolo PP, Paiva CE, de Paiva Maia YC*. Health-related quality of life became worse in short-term during treatment in head and neck cancer patients: a prospective study. Health Qual Life Outcomes 2020; 18(1): 307.
31. *Tesic M, Cankovic M, Jevtic M, Stevanovic D*. Validation of the oral health impact profile - 14 in patients with head and neck cancer. Med Oral Patol Oral Cir Bucal 2020; 25(6): e739–44.

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