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**QUALITY OF LIFE IN PATIENTS WITH MAXILLECTOMY PROSTHESES**

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**Abstract:** *Background.* This cross-sectional study sought to determine patient quality of life and function after prosthetic rehabilitation for maxillary and palate defects following cancer resection.

*Methods.* Sixty-nine patients were identified, 42 participated in the study (61%). The Obturator Functioning Scale (OFS) and 4 general quality of life measures (Mental Health Inventory [MHI], Impact of Events Scale [IES], Illness Intrusiveness Ratings Scale [IIRS], and Centre for Epidemiologic Studies Depression Scale [CES-D]) were correlated with clinical parameters.

*Results.* Leakage when swallowing foods was the most frequently reported problem with the obturator (29%). Positive correlation was noted between the OFS and both the IES subscales ( $p < .01$ ) and CES-D ( $p < .001$ ). Difficulty with speech and eating was associated with increased avoidance of social situations. The surgical approach had a significant effect on the OFS, IES, and MHI subscales ( $p < .01$ ).

*Conclusion.* These results support the findings that good obturator function is associated with a better quality of life. © 2009 Wiley Periodicals, Inc. *Head Neck* 31: 813–821, 2009

**Keywords:** maxillary; prosthesis; quality of life; cancer; outcome

**M**axillary cancers represent a rare form of head and neck malignancy that can have a profound impact on the quality of life. The direct effects of the cancer, as well as the therapeutic interventions required for treatment, can result in significant facial disfigurement<sup>1</sup> as well as functional disability involving both swallowing<sup>2</sup> and speech.<sup>3</sup>

High rates of local and regional disease control are achieved in patients after maxillary and palatal resection, but surgical treatment results in the formation of a fistula between the oral and nasal cavities. Significant problems with both speech and swallowing can result from this defect. Traditionally, obturator prostheses have been used to occlude areas of the palate that have been resected. Reconstruction with obturator prostheses diminishes difficulties associated with mastication and swallowing<sup>4</sup> and has been shown

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to result in significant improvement in speech intelligibility and communication performance.<sup>3,5</sup>

All patients with cancer endure considerable psychosocial challenges; in addition, patients with maxillary cancer bear unique quality of life burdens. Limited research has been conducted in the past assessing the psychosocial adjustment of maxillectomy patients using obturator prostheses. Early studies evaluated the adjustment required by these patients.<sup>6,7</sup> More recently, Kornblith et al<sup>8</sup> examined the long-term impact of obturator prostheses in 47 patients on basic functions such as speech and eating, as well as overall adjustment. This group found that satisfactory function of the obturator prosthesis was the most significant predictor of adjustment. In addition, the extent of hard and soft palate resection was the most significant predictor of obturator function. Kornblith concluded that a well-functioning obturator prostheses contributed to an improved quality of life for these patients. In 1999, Moroi et al<sup>9</sup> evaluated the effect of prostheses on the quality of life for 68 patients with head and neck cancer, and 35 denture wearers were used as controls. This group found that obturator prostheses were important for both eating and the patient's overall quality of life.

The purpose of this study was to add to the limited literature assessment of quality of life issues in patients using obturator prostheses for primary reconstruction of palatal defects. Significant correlates of improved quality of life are defined. The current study augments the literature by allowing further insight into the adjustments made by maxillectomy patients to accommodate their functional disabilities.

## PATIENTS AND METHODS

Patients who had undergone both palatal resection and reconstructed with obturator prostheses were identified from the Princess Margaret Hospital Dental Oncology Database. The following combinations of key words were used to search the database: head and neck cancer, hemimaxillectomy; head and neck cancer, surgery and irradiation; head and neck cancer, prosthetics; head and neck cancer, surgical splints. Patients included in the study were those who had undergone palate resections and who were not recorded as deceased.

The Research Ethics Board of the University Health Network approved the study. Appropriate consent was obtained from each patient. Identified patients were sent letters from their treating physician, informing them of future contact by the research interviewer and requesting participation in the study. Patients were given the opportunity to decline contact by the research interviewer. Patients who agreed to participate in the study were invited to the Princess Margaret Hospital for interviews. In addition, patients with obturator prostheses were also approached in clinics by treating physicians (JI and DB). Of the 89 patients potentially eligible to participate in this study, 30 were excluded: 9 had no prostheses, 3 were deceased, and 18 were lost to follow-up. Of the 69 remaining patients, 42 agreed to participate in the study (61%). Reasons for declining participation included inability to come to the Princess Margaret Hospital, illness, lack of fluency in English, and not wanting to participate in the study.

A single interviewer administered all the questionnaires. The patients were examined for the size of defect and status of dentition. The extent of resection and dentition state was mapped onto a standard palate template for each patient.

**Questionnaires.** The Obturator Functioning Scale (OFS) and 4 general quality of life measures (Mental Health Inventory [MHI], Impact of Events Scale [IES], Illness Intrusiveness Ratings Scale [IIRS], and Centre for Epidemiologic Studies Depression Scale [CES-D]) were used in this study. D'Antonio et al<sup>10</sup> emphasized the importance of using both general and disease-specific quality of life measures, as they each contribute unique information about the quality of life. The general quality-of-life measures included in this study provided information on mental health, depression, impact of disease on the individual, and disruptions in lifestyle. The disease-specific instrument provided specialized information on obturator function.

*Obturator Functioning Scale.* This 15-item scale was designed by Kornblith et al<sup>8</sup> to assess eating ability, speech, and cosmetic satisfaction. A 5-point Likert scale is used to rate the items with higher scores, reflecting greater difficulty with obturator function. One item, such as "difficulty

talking on the phone,” was added to the scale to assess communication difficulties in the absence of visual cues.

**Mental Health Inventory.** This scale was developed by Veit and Ware.<sup>11</sup> It is a 38-item scale, which measures psychological distress and well being. The 5 subscales include anxiety, depression, general positive affect, emotional ties, loss of behavior, and emotional control. Thirty-six of the items are rated on a 6-point Likert scale, and 2 are rated on a 5-point scale. A higher MHI equates to a poorer mental health.

**Illness Intrusiveness Ratings Scale.** This scale developed by Devins et al<sup>12</sup> measures disruptions in lifestyle induced by illness. It is a 13-item scale covering several life domains, which has been shown to be reliable and valid in a range of chronic health conditions including laryngeal cancer, breast cancer, chronic renal failure, multiple sclerosis, and rheumatoid arthritis.<sup>13</sup> Responses are rated on a scale of 1 to 7, with higher scores indicating greater intrusiveness.

**Center for Epidemiologic Studies-Depression Scale.** This is a 20-item measure of depressive symptoms.<sup>14</sup> This scale, which has been used recently in studies of depression in patients with head and neck cancer, has been shown to be reliable and valid in a range of medically ill populations including cancer.<sup>15-17</sup> Responses are rated from 0 to 3, with higher scores indicating greater levels of depression.

**Impact of Events Scale.** This is a 15-item scale that measures the posttraumatic stress associated with any specific life event.<sup>18,19</sup> Two categories of experience, avoidance and intrusive thoughts, are measured. Items are rated according to the frequency of the occurrence of the intrusive or avoidant reaction. Responses are scored from 0 to 5 and higher scores reflect more stressful impact. For the purpose of this study, the stressful life event was described as cancer and its surgical treatment.

A chart review was performed to collect data on surgical approach, extent of ablation, preop dental status, radiotherapy, recurrence, stage, pathology, and current status.

**Table 1.** Sociodemographic characteristics of patients ( $n = 42$ ).

Variable	N (%)
Sex	
Male	12 (29)
Female	30 (71)
Age	
20-39	6 (15)
40-59	12 (29)
60-69	11 (27)
70+	12 (29)
Marital status	
Married	31 (74)
Separated	2 (5)
Divorced	4 (9)
Widowed	5 (12)
Employment status	
Employed full or part-time	12 (28)
Retired	20 (48)
Homemaker	4 (10)
On disability	3 (7)
Unemployed	3 (7)
Educational status	
≤11th grade	13 (31)
High school	11 (26)
Some college	1 (2)
College graduate	6 (14)
Beyond college	10 (24)

**Statistical Analyses.** Pearson correlation coefficients and Student  $t$  tests were calculated using SPSS for Windows (SPSS, Chicago 1999). The sample size precluded our ability to perform multivariate analyses with sufficient power. In view of this, significance was considered if the  $p$  value was less than .01. Trends ( $p < .05$ ) were tabulated for consideration.

## RESULTS

**Sociodemographic and Medical Characteristics.** Forty-two patients participated in the study. There were no missing values for the questionnaires. Only 1 patient did not state their level of education, and all other demographics were complete. Table 1 lists the sociodemographic characteristics of the patients. Time from operation to participation in this study ranged from 1 to 38 years (average, 8 years). Seventy-one percent of the patients were women, and the mean age was 60.7 years with a standard deviation of 15.3 years. Seventy-four percent of the patients were married, 5% were separated,

**Table 2.** Medical characteristics of patients ( $n = 42$ ).

Variable	<i>N</i> (%)
Type of surgery	
Transoral	26 (62)
Transfacial (lateral rhinotomy)	16 (38)
Extent of hard palate resected	
<25%	15 (36)
>25%	27 (64)
Total	0
Extent of soft palate resected	
None	37 (88)
<25%	0
>25%	5 (12)
Total	0
Maxillary teeth status	
Dentulous or partially edentulous	11 (26)
Edentulous	31 (74)
Had radiotherapy?	
Yes	22 (52)
No	20 (48)
Stage of disease	
Carcinoma in situ	1 (2)
T1	7 (17)
T2	10 (24)
T3	4 (10)
T4	18 (43)
Unknown	2 (5)
N0	41 (98)
N1	1 (2)
M0	42 (100)

9% divorced, and 12% widowed. Only 28% of the patients were employed, and 48% of the patients were retired. Most of the patients had completed high school (69%).

The medical characteristics are listed in Table 2. A transoral approach (nonfacial) had been used for surgical resection in 62% of the patients. The remaining 38% had undergone a facial approach (lateral rhinotomy, extended lateral rhinotomy, craniofacial resection). Sixty-four percent of the patients had more than 25% of the hard palate resected, and only 12% of patients had a soft palate resection. All patients with a soft palate resection had more than 25% resected. Seventy-four percent of the patients had been edentulous. Fifty-two percent of the patients had undergone radiotherapy. Only 5% of the patients had received chemotherapy. Local recurrences occurred in 21% of the patients, regional recurrences in 5%, and there were no reports of systemic recurrence. The stage of disease is tabulated in Table 2.

**Obturator Functioning Scale.** Obturator functioning difficulties are listed in Table 3. Patients

reported most difficulty with leakage when swallowing foods. Other areas of difficulty included a dry mouth and chewing difficulty. Patients reported the least difficulty with speech intelligibility, inserting or removing the obturator, and avoidance of family and social events. Dissatisfaction with facial appearance was significantly related to unusual appearance of upper lip ( $p < .001$ ), avoidance of family or social events ( $p < .001$ ), and difficulty in chewing food ( $p < .01$ ).

**Obturator Function and Quality of Life.** Significant positive correlation was noted between the OFS and the IES (Table 4), both on the avoidance ( $p < .01$ ) and intrusion ( $p < .01$ ) subscales. In addition, there was a significant positive

**Table 3.** Reported difficulties with obturator prosthetic functioning ( $n = 42$ ).

Item	Not at all to a little difficult (%)	Somewhat difficult (%)	Very much to extremely difficult (%)
Eating problems subscale			
Difficulty in chewing foods	45	33	22
Leakage when swallowing foods	58	14	29
Speech problems subscale			
Voice different from before surgery	71	10	19
Difficulty talking in public	78	12	10
Speech is nasal	78	12	10
Difficulty pronouncing words	71	19	10
Speech is difficult to understand	93	7	0
Difficulty talking on the phone	86	12	2
Other items in scale			
Mouth feels dry	62	10	28
Dissatisfaction with looks	76	12	12
Clasp on front teeth noticeable	81	2	2
Any area feels numb	69	12	19
Avoidance of family or social events	93	2	5
Difficulty to insert or remove obturator	93	5	2
Upper lip looks funny	76	12	12

**Table 4.** Significant correlations of measures of obturator functioning and adaptation.

Scales	Total ( <i>r</i> )	Speech ( <i>r</i> )	Eating ( <i>r</i> )
MHI			
Global psychological distress	–	–	–
Global psychological well being	–	–	–
Impact of Events Scale			
Total scale	.49 ( <i>p</i> < .01)	.34 ( <i>p</i> < .05)	.31 ( <i>p</i> < .05)
Avoidance subscale	.40 ( <i>p</i> < .01)	.37 ( <i>p</i> < .05)	–
Intrusion subscale	–	–	–
Illness Intrusiveness Scale			
Total scale	–	–	–
Relationships/personal development subscale	–	–	–
Intimacy subscale	–	–	–
Instrumental life domains subscale	–	–	–
CES-D Scale	.49 ( <i>p</i> < .001)	.38 ( <i>p</i> < .05)	–

Abbreviations: MHI, mental health inventory; CES-D, center for epidemiological studies-depression scale.

correlation between the total OFS and the CES-D scale ( $p < .001$ ). There was a noticeable trend between the MHI subscales and the total OFS (Table 5). The OFS was related with depression ( $p < .05$ ) and loss of behavior or emotional control ( $p < .05$ ) subscales of the MHI. A negative correlation was seen between the OFS scores and the positive affect subscale of the MHI ( $p < .05$ ). Items of the OFS were correlated with different scales to identify the obturator functioning questions that were significantly correlated with the quality of life. These results are shown in Table 6.

**Predictors of Good Quality of Life.** The different sociodemographic and medical variables were analyzed to identify predictors of good quality of life. On the CES-D scale, both women (mean = 10.8) and men patients (mean = 6.3) scored well below the generally accepted cutoff score of 16, indicating a low likelihood of clinically significant depressive distress. There was no significant difference between sex CES-D scores. Patients who had undergone a facial approach reported significantly higher scores on the OFS than those who had undergone a nonfacial

approach ( $p < .01$ ). In addition, when comparing the avoidance subscale of the IES against the different surgical approaches, it was significantly greater in the facial approach group ( $p < .01$ ). Level of education was not related to the quality of life (data not shown).

The performances of the facial and nonfacial groups on the different subscales of the MHI were also compared. On the loss of behavior or emotional control subscale, the facial group had a significantly higher score ( $p < .01$ ) than the nonfacial group. In addition, the nonfacial group was significantly better on the psychological well-being subscale ( $p < .01$ ).

When the percentage of hard palate resected was used to divide the data (greater than, or less than 25%), no significant differences were noted between the 2 groups in obturator function or quality of life. Patients with full dentition were compared with those who were edentulous, and again no significant differences were noted between the 2 groups. Finally, when patients who had undergone radiotherapy were compared with those who had not, higher scores on the relationship and personal development subscale of the IIRS were noted in the radiotherapy group (radiation mean = 11.2; no-radiation mean = 7.2), although this did not reach statistical significance ( $p < .05$ ).

**Mean Scores.** The mean scores for the 4 general quality of life measures used in this study are presented in Table 7. The mean total score for the IES was 15.3. The suggested cutoff is 26, with scores above 26 implying moderate to severe impact. The mean CES-D score was 9.5. Therefore, this population, as a whole, scored well below the cutoff of 16 on the CES-D for a diagnosis of clinical depression. It should be noted, however, that 17% of the patients were above 16 on the CES-D scale (data not shown).

**Table 5.** Significant correlations of obturator function total score with MHI subscales.

MHI subscales	Obturator function scale, total score
Anxiety	Not significant
Depression	.32 ( <i>p</i> < .05)
Loss of behavior/emotional control	.37 ( <i>p</i> < .05)
General positive affect	–.31 ( <i>p</i> < .05)
Emotional ties	Not significant

Abbreviations: MHI, mental health inventory.

**Table 6.** Significant correlations of obturator functioning items with adaptation measures.

Obturator functioning	MHI		IES		IIRS			CES-D ( <i>r</i> )
	Distress ( <i>r</i> )	Well being ( <i>r</i> )	Avoidance ( <i>r</i> )	Intrusion ( <i>r</i> )	RPD ( <i>r</i> )	Intimacy ( <i>r</i> )	ILD ( <i>r</i> )	
Speech								
Voice is different	–	–	.36 ( <i>p</i> < .05)	.35 ( <i>p</i> < .05)	–	–	–	–
Difficulty pronouncing words	–	–	.55 ( <i>p</i> < .001)	.51 ( <i>p</i> < .001)	–	–	–	.34 ( <i>p</i> < .05)
Difficulty talking in public	–	–	–	–	–	–	–	–
Difficulty talking on the phone	.37 ( <i>p</i> < .05)	–	–	.39 ( <i>p</i> < .01)	–	.43 ( <i>p</i> < .01)	–	.47 ( <i>p</i> < .01)
Speech is nasal	–	–	–	–	–	–	–	–
Speech not understandable	–	–	–	–	–	–	–	–
Eating								
Difficulty chewing food	–	–	.31 ( <i>p</i> < .05)	–	–	–	–	–
Leakage swallowing food	–	–	–	–	–	–	–	–
Appearance								
Dissatisfaction with looks	–	–	.34 ( <i>p</i> < .05)	–	–	–	–	–
Other								
Avoidance of family or social events	.35 ( <i>p</i> < .05)	–	.46 ( <i>p</i> < .01)	.53 ( <i>p</i> < .001)	.52 ( <i>p</i> < .001)	.33 ( <i>p</i> < .05)	–	.59 ( <i>p</i> < .001)
Dryness of mouth	–	–	–	–	–	–	–	–
Difficulty inserting obturator	–	–	–	–	.39 ( <i>p</i> < .05)	–	–	–
Clasp on teeth noticeable	–	–	–	.33 ( <i>p</i> < .05)	–	.44 ( <i>p</i> < .01)	–	–

Abbreviations: MHI, Mental Health Inventory; IES, Impact of Events Scale; IIRS, Illness Intrusiveness Ratings Scale; CES-D, Center for Epidemiological Studies-Depression Scale; RPD, Relationships and Personal Development; ILD, Instrumental Life Domains.

The mean scores for the CES-D and IIRS in this maxillectomy population were compared against other patient populations. The scores of the maxillectomy population on the CES-D and

the IIRS were numerically lower than the other patients with head and neck cancer as well as other disease populations, including multiple sclerosis, renal disease, and rheumatoid arthritis

**Table 7.** Group means for the different scales.

Group means	Mean	Range	
CESD total score	9.5	0–60	↑ score = ↑ depression
IES-intrusive subscale score	6.9	0–35	↑ score = ↑ intrusive thought
IES-avoidance subscale score	8.4	0–40	↑ score = ↑ avoidant thought
IIRS-RPD subscale score	1.9	0–42	↑ score = ↑ intrusiveness
IIRS-intimacy subscale score	1.4	0–14	↑ score = ↑ intrusiveness
IIRS-ILD subscale score	2.4	0–28	↑ score = ↑ intrusiveness
IIRS total score	21.7	0–91	↑ score = ↑ intrusiveness
Abbreviation: MHI-anxiety subscale score	18.2	10–60	↑ score = ↑ anxiety
MHI-depression subscale score	7.6	5–29	↑ score = ↑ depression
MHI-loss of behavior or emotional control subscale score	15.9	9–53	↑ score = ↑ emotional control
MHI-general positive affect subscale score	44.1	11–66	↑ score = ↑ positive affect
MHI-emotional ties subscale score	10.5	3–18	↑ score = ↑ emotional ties
MHI-psychological distress subscale score	41.7	24–142	↑ score = ↑ distress
MHI-psychological wellbeing subscale score	54.1	14–84	↑ score = ↑ positive affect

Abbreviations: MHI, Mental Health Inventory; IES, Impact of Events Scale; IIRS, Illness Intrusiveness Ratings Scale; RPD, Relationships and Personal Development; ILD, Instrumental Life Domains; CES-D, Center for Epidemiological Studies-Depression Scale.

## DISCUSSION

Traditionally, end points such as recurrence rates and survival, have been used to evaluate therapeutic interventions in head and neck cancer. Recently, the recognition of the multidimensional impact of these tumors has led to an increased interest in the quality of life of these patients. This study assessed quality of life issues in patients who underwent reconstruction with obturator prostheses following maxillectomy. The small numbers in this study reflect the rarity of this head and neck cancer. The higher female predominance seen in our results may be due, in part, to the relatively low (61%) response rate, skewing the results. However, other publications have reported this female predominance.<sup>26</sup>

In this study, patients reported little difficulty with speech intelligibility, manipulating the obturator, and avoidance of family or social events. These results are consistent with those obtained by Kornblith et al.<sup>8</sup> However, our group reported more problems with leakage and chewing difficulty (Table 3) than did the previous study.<sup>8</sup> This may be because a greater proportion of our subjects had more than 25% of their hard palate resected when compared with the patients in the 1996 study.

Good obturator function has been previously reported to contribute to the improved quality of life.<sup>8</sup> Our results support this observation. Specifically, patients with increasing difficulty with obturator function reported increased disease impact, depression, loss of behavior or emotional control and decreased positive affect.

Certain groups of patients were more severely affected than others. The most salient result was related to the surgical approach, ie, facial approach (lateral rhinotomy, extended lateral rhinotomy, craniofacial resection) compared with nonfacial approach. Patients who underwent a facial approach reported a lower quality of life than those who underwent a transoral approach. Specifically, they reported significantly greater scores on the OFS. This may be related to the extent of surgical resection, such that patients undergoing facial approaches had more extensive disease and subsequently required more extensive surgery. This consequently led to greater difficulties with obturator

function. The surgical approach also impacted significantly on the MHI outcomes. The results showed a significant difference in psychological well being in the nonfacial group and less loss of behavioral or emotional control when compared with the facial group. Finally, when comparing the avoidance subscale of the IES with the different surgical approaches, it was significantly greater in the facial approach group. The higher score in the facial group implies greater avoidance of certain thoughts, emotions, and situations in this group when compared with the nonfacial group. It is possible that the facial scar resulting from the surgery was a constant reminder of the cancer and associated ordeal and contributed to the poorer psychological status of the facial group. We recognize that lack of multivariable analysis is a study limitation, and it is difficult to determine whether a reduced quality of life is due to the surgical approach or due to the disease characteristic that resulted in the surgical approach chosen. Women patients showed a higher level of depression than men patients, although this did not reach significance. Previous studies have also shown that women patients report more symptoms of depression than men,<sup>27,28</sup> although the literature comparing women to men patients with cancer have not found this consistently. A number of studies, however, have found that women patients with head and neck cancer exhibit more depressive distress than men patients do.<sup>29</sup> Given the higher level of depression in the women subjects, it is likely that women patients would benefit from greater psychosocial support, both before and after surgery.

The mean score results (Table 7) imply that our maxillectomy patient cohort group had a low posttraumatic score (IES), and the CES-D scores suggested our patients, as a whole, did not meet the diagnostic criteria for depression. However, it should be noted that 17% of our patients scored above 16 on the CES-D score, implying that they were experiencing distress similar in intensity to what one observes among depressed psychiatric patients. Nevertheless, CES-D scores alone cannot be interpreted as identifying a person who meets diagnostic criteria for depression. It appears, therefore, that our patient cohort experienced some distress but, on average, this was not in the range that one sees among the depressed psychiatric patients.

The quality of life in maxillectomy patients was compared with that of the other disease

populations. The maxillectomy patients compared favorably with other patients with head and neck cancer as well as other disease populations, both in terms of levels of depression and illness intrusiveness. This suggests that maxillectomy patients with obturator prostheses adjust well to their functional disability and enjoy a quality of life equivalent to, or better than, other chronic disease populations (C.M. Shapiro and C.M. Devins, unpublished data).<sup>13,16,20–25</sup>

The results of this study show that meaningful quality of life can be achieved in patients who have undergone reconstruction with obturator prosthesis following maxillectomy. Obturator functioning is strongly correlated with the quality of life. However, we recognize that the life contexts in which disease and treatment occur are also powerful determinants of quality of life. The presence of loving families, socioeconomic advantages, and valued activities and interests, all help people with cancer (as, indeed, they help all people) to enjoy a high quality of life. On the other hand, an absence of psychologically meaningful activities, independent stressful life events, and chronic strains among other problems compromise quality of life (again both in cancer and in all populations). We acknowledge that our data did not explore in-depth socioeconomic variables that may contribute to the results shown.

With that in mind, clinically, the OFS may be used to identify those groups of patients who are likely to have a poor quality of life. We added a question specifically relating to difficulty talking on the phone in the OFS scale. We found this to be a useful addition to identify adaptation measures (Table 6) and suggest that it is added to the OFS. Therefore, after every effort has been made to optimize obturator function, the physician can use this scale as a tool to identify patients who are likely to do poorly and focus rehabilitation efforts to improve their outcome.

Patients who are scheduled to undergo maxillectomy often ask about the quality of life they should expect following surgery. The results of this study combined with previous studies can be used to better inform patients of the expected outcome. We recognize that our response rate (61%) may result in a degree of volunteer bias, despite this, we expect patients following maxillectomy and prosthetic reconstruction to have a good quality of life overall and this data can be used to reassure patients.

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