

Research Article

Changes in Oral Cavity Functions Assessment with the Use of the Functional Intraoral Glasgow Scale (FIGS) in Patients after Subtotal or Total Glossectomy

Ludmila Halczy-Kowalik^{1*}, Malgorzata Stecewicz², Anna Rzewuska³, Violetta Posio⁴ and Dorota Margula⁵

¹Independent Laboratory of Postoperative Rehabilitation in Maxillofacial Surgery, Pomeranian Medical University, Poland

²Institute of Pedagogy, University of Szczecin, Poland

³Clinic of Maxillofacial Surgery, Pomeranian Medical University, Poland

⁴Department of Imaging Diagnostics and Interventional Radiology, Pomeranian Medical University, Poland

⁵Doctoring Study, Pomeranian Medical University, Poland

Special Issue on

Oral Cancer

*Corresponding author

Ludmila Halczy-Kowalik, Independent Laboratory of Postoperative Rehabilitation in Maxillofacial Surgery, Pomeranian Medical University, ul.Powstancow Wielkopolskich 72, 70-111 Szczecin, Poland, Email: sprpchst@sci.pum.edu.pl

Submitted: 21 December 2013

Accepted: 30 January 2014

Published: 03 February 2014

ISSN: 2333-7133

Copyright

© 2014 Halczy-Kowalik et al.

OPEN ACCESS

Keywords

- Functional intraoral glasgow scale
- Glossectomy
- Oral cancer
- Tongue excision
- Clinical advancement of a tumor

Abstract

Oral functions such as chewing, swallowing and speech can be disturbed due to a tumor proliferation that affects the tongue, and are substantially impaired after the excision of the tumor. Self-assessment of the aforementioned functions performed by the patients individually and in cooperation with the use of the functional intraoral Glasgow scale (FIGS) revealed that the functions were compromised after the excision of the tumor of higher clinic advancement in elderly patients after the excision of the anterior part of the oral cavity. Improvement of these functions after three, six and twelve months postoperative was slower in tumors with higher clinic advancement after excision with reconstruction.

ABBREVIATIONS

FIGS: Functional Intraoral Glasgow Scale

INTRODUCTION

The tongue takes part in all oral functions; its correct position determines the airway patency; its sensitivity provides proper food bolus assessment before the swallow; its motility effectiveness allows for bolus formation due to swallow and participation in swallowing act. The proportion on the tongue to the palate, lip and alveolar process, and their dental articulation determine consonants pronunciation. The changing shape of the tongue in the vocal tract is responsible for consonants production. The tumor infiltration can gradually restrict sensitivity and motility of the tongue, and subtotal or total glossectomy due to oral cavity cancer suddenly limits the effectiveness of the tongue. Irradiation at one month postoperative is neither favorable for the operated area and the underlying structures.

Preoperative patients are educated about the re-education of the swallowing and rehabilitation of the speech which begin with the breath control and attempts to swallow saliva on the

second day postoperative. Exercises to improve tongue, lip and mimic muscles of the face motion, mandible abduction, elongated apnea, and saliva swallowing are introduced after the operative wound healing.

MATERIALS AND METHODS

The participants of the study were one hundred patients undergoing operations due to oral cavity cancer including the tongue. Following terms were used for the assessment of the clinic advancement of the tumor: T_I for a tumor smaller than 2 cm; T_{II} for a tumor size of 2-4 cm, confluent lymph nodes are not enlarged; T_{III} for a tumor size greater than 4 cm, or of other size, with one enlarged lymph node up to 3 cm on the neck ipsilateral; T_{IV} for a tumor size greater than 4 cm, or of other size, which infiltrates the adjacent structures of the oral cavity, the lymph nodes on the neck unilateral or bilateral, single or multiple, can be greater than 6 cm. The data considering the patients' characteristics, tumor site and clinical advancement, the range of tumor excision and reconstruction are presented in Table 1. Surgical reconstruction was performed in one stage with the excision of the tumor in patients, in whom the range of tissue excision would be the

prognosis for the most severe functions impairment which meant that the whole or almost the whole tongue, the mental part of the mandible with the anterior part of the floor of mouth, and the anterior part of the tongue were excised. Reconstruction using prosthesis was performed in patients after the palate resection or the jaw with the palate resection after a week postoperative.

Functional intraoral Glasgow scale was used by the patients with oral cavity cancer preoperative and postoperative at one, three, six, and twelve months, and after oncologic examination, as a self-assessment of chewing, swallowing and speech. Every patient was given a simple five-point ordinal scale self-questionnaire to self-assess each of the aforementioned functions. Table 2 presents the questions from the questionnaire and possible scores. Data obtained in the further examinations were recorded in a database which included the details about the patients, tumor details, and the surgical procedures. Video-fluoroscopic examination of the swallowing act performed between the period of 2-4 weeks postoperative allowed to assess the swallowing efficiency, to investigate the compensatory

mechanisms applied spontaneously adopted by the patients, to adopt the mechanisms that improve swallowing, but foremost to recognize or to eliminate aspiration.

The majority of the patients was subjected to re-education of the swallowing and speech rehabilitation.

The data were analyzed with T-Student test for dependent variables, ANOVA variance analysis test, and Spearman's Rank Order Correlation.

RESULTS AND DISCUSSION

One hundred patients with oral cavity cancer participated in the preoperative examination. The minimum total score in the functional intraoral Glasgow scale self-assessment questionnaire is 9 points; the maximum total score is 15 points; the average total score is 13.25 points. Only twenty-five patients awarded their chewing with the maximum total score; forty-six patients awarded their swallowing with the maximum total score; ninety-five patients awarded their speech with the maximum total score.

Table 1: Characteristics of the patients who had surgical treatment of oral cavity cancer, including tumor site, tumor size, range of tumor excision, and reconstructive therapy done.

Characteristics		Statistics	
Gender	Female	30	
	Male	70	
Age	Female	33-77 years, the average age: 57.5 years	
	Male	31-80 years, the average age: 59.3 years	
Tumour site		21	
Tongue	Root of the tongue	13	
Floor of the mouth	Retromolar triangle	42	
Palate, gingiva		18	
		6	
Tumour size	T _I	1	
	T _{II}	26	
	T _{III}	55	
	T _{IV}	18	
Range of tumor excision		Reconstruction	
1 – lateral part of the tongue, the floor of mouth, and the alveolar process In the mandible 2 – the aforementioned + a fragment of the mandible of full thickness 3 – the tongue Or the palate with a part of the jaw 4 – the anterior part of the oral cavity: the floor of mouth, the anterior part of the mandible and the tongue 5 – the Root of the tongue, the tonsillar pillar, and the lateral wall of the pharynx	14 13 44 19 10	yes	
		no	
		0	14
		2	11
		11	33
6	13		
1	1		

Table 2: Functional intra-oral Glasgow scale (FIGS) with a Total score of 15 points.

I can chew:	I can swallow:	My speech is:
Any food, no difficulty 5	Any food, no difficulty 5	Clearly understand always 5
Solid food, with difficulty 4	Solid food, with difficulty 4	Requires repetition sometimes 4
Semisolid food, with no difficulty 3	Semisolid food only 3	Requires repetitions many times 3
Semisolid food, with difficulty 2	Liquids only 2	Understood by the relatives only 2
Cannot chew at all 1	Cannot swallow at all 1	Unintelligible 1

Clinical advancement and the site of the tumor did not correlate with the total oral function score preoperative, although repetitive correlations, such as withdrawal of solid food in patients with the tumor of root of the tongue and retromolar triangle tumor, reported speech disturbances in patients with the tumor of the anterior part of the oral cavity infiltrating the tongue were observed. The patients awarded their speech with the maximum total score, but they awarded their chewing with the minimum total score. In the elder patients chewing correlated ($p=0.024$) with lower scores, and their total oral function score was lower ($p=0.074$).

Sixty-one patients who had oral nutrition participated in the examination at one month postoperative. Video-fluoroscopic swallowing examination revealed that in the rest of the patients had their oral transport time increased, post-deglutition retention in the lower pharynx, and aspiration threatening. Temporary gastric-tube nutrition was maintained in thirty-six patients. Temporary gastrostomy was performed in three patients. All of the aforementioned patients were re-educated due the swallowing.

Fifty patients who had oral nutrition participated in the examination at three months postoperative. The appointment date interfered with postoperative irradiation.

Thirty-five patients all of whom had oral nutrition participated in the examination six months postoperative. Forty-three patients all of whom had oral nutrition participated in the examination at one year postoperative.

None of the patients was affected with cancer recurrence during the first year postoperative. In one of the patients a neoplasm (sarcoma) of the soft-tissues next to the postoperative scar in the irradiation area was recognized. One patient died after two months postoperative due to myocardial infarct.

ANOVA variance analysis test which included the time of examination and the age of the patients presented lower self-assessment scores for chewing ($p=0.0002$), swallowing ($p=0.0017$), speech ($p=0.0240$), and for total function score ($p=0.0002$) in elder patients.

The minimum total score of FIGS at one month postoperative was the score of 3 points for total oral function; the maximum score was the score of 14 points; the average score was the score of 7.34 points. The aforementioned scores were the lowest total oral function score assessment performed during the first year postoperative. Further assessments performed at three, six and twelve months postoperative were awarded with the scores of 6.86 points, 9.37 points, and 10.37 points respectively.

Total oral function score which was the lowest postoperative correlated with individual functions scores.

Chewing, which had been awarded with the lowest scores postoperative among the rest of the functions, was awarded with scores higher of between 1.69 and 2.95 points afterwards. Correlations between the postoperative examinations to the preoperative examination were significant ($p=0.0029$), and were greater of between 0.46 and 0.71 points postoperative.

Swallowing, which had been awarded with low scores postoperative, was awarded with scores higher of between 2.32

and 3.40 points. Proportion of the assessments in the individual examinations preoperative was significant ($p=0.0002$), and was greater of between 0.52 and 0.74 points.

Speech, which had been awarded with the highest scores postoperative, was awarded with scores higher of between 3.36 and 3.88 points. Correlation was significant ($p=0.0288$) (Figures 1 and 2), and was greater of between 0.68 and 0.78.

ANOVA variance analysis test which included the time of examination and clinic advancement of the tumor revealed that chewing, swallowing, speech, and total oral function correlate with the clinic advancement of the tumor. The aforementioned correlation was significant at the 0.0012 level for chewing, at the 0.0000 level for swallowing, at the 0.0009 level for speech, and at the 0.0000 level for total oral function. Table 3 presents mean values for the aforementioned functions including the clinic advancement of tumor. Improvement of the oral functions was slower in patients treated due to more clinical advanced tumor (Figure 3).

ANOVA variance analysis test which included the time of examination and the range of tumor excision revealed correlation between chewing ($p=0.0415$), swallowing ($p=0.0613$), speech ($p=0.0329$), and total oral function ($p=0.0146$) in patients after the excision of the anterior part of the oral cavity (the anterior part of the tongue, the floor of mouth, and the mental part of

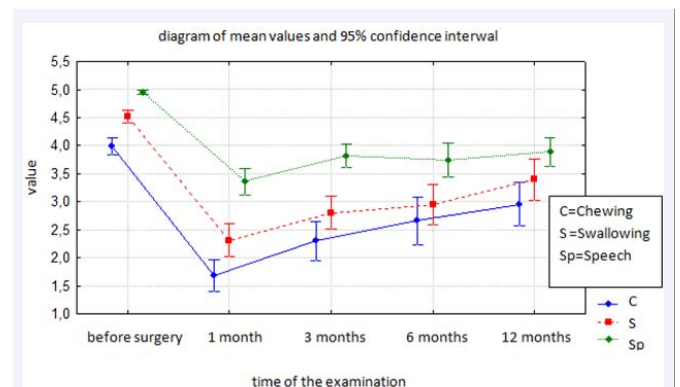


Figure 1 Chewing, swallowing and speech assessment preoperative, and postoperative at one, three, six, and twelve months.

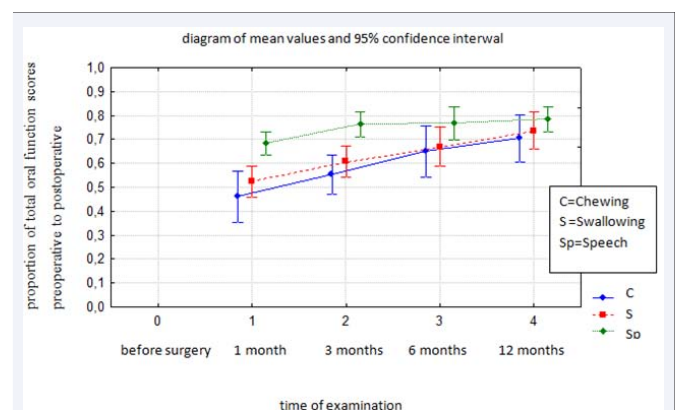


Figure 2 Changes in mean scores of chewing, swallowing, and speech assessment postoperative at one, three, six, and twelve months in comparison to the preoperative assessment.

Table 3: Chewing, swallowing and speech assessment during next examinations, including size of the tumor (* one of the patients with a tumor with T1 size was counted among the patients with tumors with T2 size).

Time of examination	Clinical advancement of the tumor	N	CHEWING	SWALLOWING	SPEECH	FIGS TOTAL SCORE
			mean values			
Preoperative	2*	27	4,11	4,59	5,00	13,70
Preoperative	3	55	3,96	4,44	4,93	13,27
Preoperative	4	18	3,89	4,61	4,94	13,44
Postoperative at 1 month	2	15	2,20	3,07	3,87	9,13
Postoperative at 1 month	3	35	1,63	2,17	3,23	7,00
Postoperative at 1 month	4	11	1,18	1,73	3,09	6,00
Postoperative at 3 months	2	10	3,00	3,70	4,10	10,80
Postoperative at 3 months	3	28	2,11	2,64	3,82	8,52
Postoperative at 3 months	4	12	2,17	2,42	3,58	8,08
Postoperative at 6 months	2	6	3,50	3,83	4,50	11,50
Postoperative at 6 months	3	23	2,48	2,74	3,70	9,04
Postoperative at 6 months	4	6	2,50	2,83	3,17	8,50
Postoperative at 12 months	2	11	3,18	3,82	3,91	11,27
Postoperative at 12 months	3	25	3,12	3,48	3,96	10,65
Postoperative at 12 months	4	7	2,00	2,43	3,57	8,00

the mandible) and the patients with different range of excision (Figure 4).

ANOVA variance analysis test which included the time of examination and the reconstruction revealed significantly lower correlation between swallowing ($p=0.0015$), speech ($p=0.0012$), total oral function ($p=0.0053$) in patients who had undergone reconstruction and the patients who had not (Figure 5). Changes in the assessed functions was unfavorable for the patients who had undergone reconstruction, especially after six and twelve months postoperative (Table 6).

Infiltration of the tumor on the organs of the stomatognathic system gradually restricts their functions and compromises chewing, swallowing and speech. The patients may not be aware of their disease, they withdraw of particular foods, accepting food easy to swallow without long food bolus formation. More than a half of the patients had difficulties with solid food swallowing, and the two-thirds of the patients withdrawn that kind of food. The reason for patients' unwillingness to chewing solid food was possibly significant lack of teeth, inadequate adherence of the teeth prosthesis, or other limitations due to cancer. Difficulties in solid food swallowing could be the result of pain, restrictions in tongue mobility due to tumor infiltration, or inadequate food tract patency.

Tumor site and its clinic advancement did not correlate with oral functions of the patients, although some of the repetitive correlations were observed as follows: withdrawal of solid food in patients with the root of tongue tumor and retromolar triangle tumor; speech disturbances in patients with the tumor of the anterior part of the oral cavity infiltrating the tongue.

Colangelo et al. [1] described preoperative disturbances in oral functions in one-thirds of the patients with surgical oral cancers, in whom the size of the tumor correlated with clinic advancement of the tumor. Inadequate efficiency of swallowing was juxtaposed with infiltration of the anterior part of the oral part of the tongue and the root of tongue, and unintelligibility of the speech was juxtaposed with the infiltration of the tongue

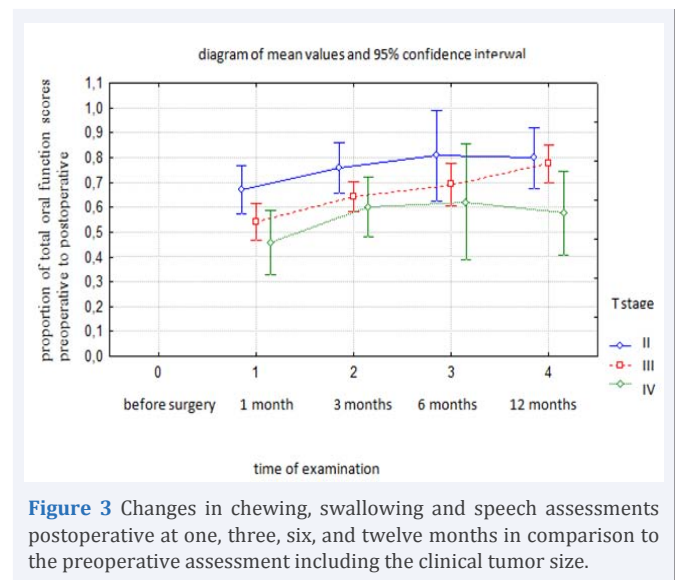


Figure 3 Changes in chewing, swallowing and speech assessments postoperative at one, three, six, and twelve months in comparison to the preoperative assessment including the clinical tumor size.

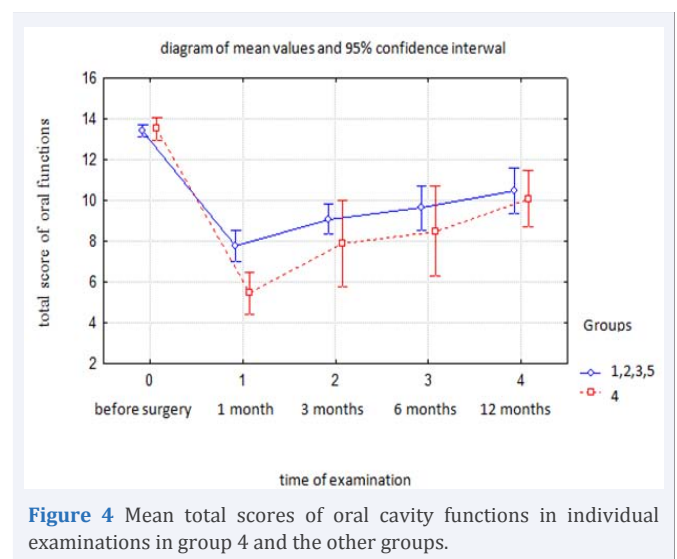


Figure 4 Mean total scores of oral cavity functions in individual examinations in group 4 and the other groups.

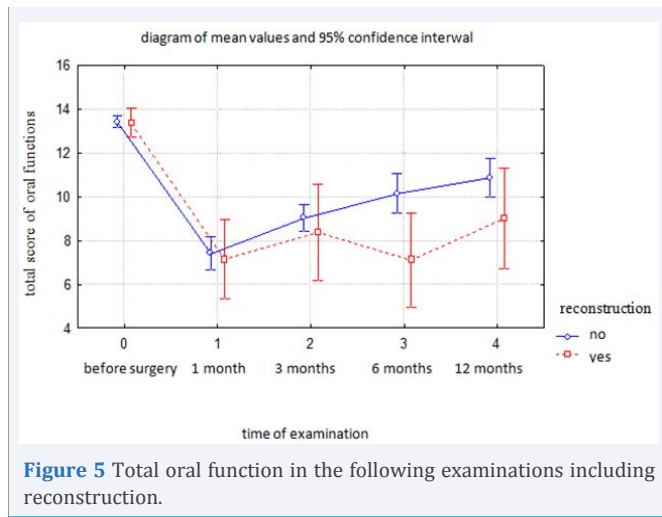


Figure 5 Total oral function in the following examinations including reconstruction.

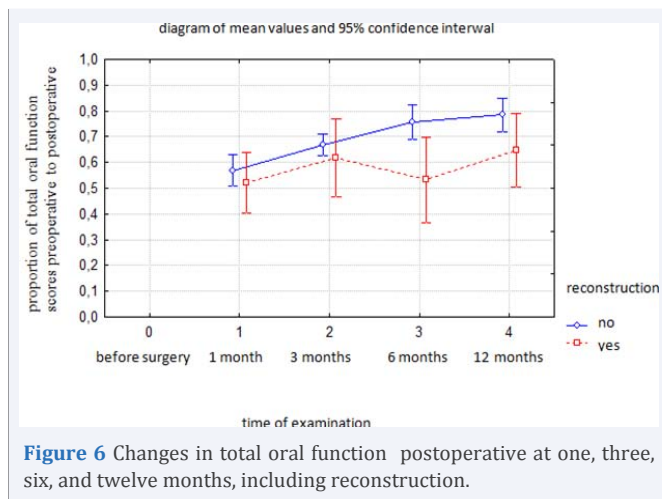


Figure 6 Changes in total oral function postoperative at one, three, six, and twelve months, including reconstruction.

and palate. Patients with oral cavity cancer treated surgically by Ellabban et al. [2] self-assessed the oral functions in FIGS preoperative with 14 points on average, and more than 60% of the patients awarded chewing, swallowing and speech with the highest scores. Preoperative scores of the oral functions by Goldie et al. [3] and by Paulosky et al. [4] in correlation with the size of tumor allowed to prediction about possible disturbances in the aforementioned functions after the excision of the tumor.

Swallowing disturbances and speech production are possible to predict consequences of oral cavity cancer excision, particularly in the case of significant part of the tongue excision range. Low scores for chewing, swallowing and speech awarded by the patients postoperative at 1 month were gradually increasing during twelve months postoperative. Impairment of chewing, swallowing and speech was more severe and it recovered more slowly in patients with the tumor of greater clinic advancement.

Authors who describe functions of the stomatognathic system after the oral cavity operation due to cancer juxtapose them with clinic advancement of the tumor, as a quality of life factor. Schliephake et al. [5] stated that one-year period postoperative is the period necessary to determine oral cavity functions as priority over the others, such as the appearance or social life, particularly in patients surgically treated due to oral cavity tumors T_{III} or T_{IV}.

The lowest scores during our examinations were awarded by patients in whom the range of the excision included the anterior part of the oral cavity independently on the reconstruction. After one year postoperative the score of the total oral function was any different from the scores in different excision range.

Speksnijder et al. [6] reported the correlation of oral cavity functions differences between the patients after the palate and jaw resection and the patients after resection and reconstruction of the mandible; the latter assessed the oral functions as poorer than preoperative in five-year period. The aforementioned authors emphasized the key role of the efficient tongue in the oral functions. According to Chuanjum et al. [7], reconstruction of the tongue after its subtotal or total excision, with the use of a free flap from the forearm was the reason for impairment of speech due to the lack of flexibility of the flap connected with the stump of the tongue. According to Kimata et al. [8], reconstruction of the whole tongue with the use of free flaps and vessels microanastomosis allowed for the most intelligible speech production in case of the reconstructed tongue protrusion toward the palate, or reduced intelligibility in case of the flat or concaved tongue. According to Hara et al. [9], the postoperative time is particularly important for function assessment after reconstruction. The aforementioned time is necessary for the tissues used for reconstruction to be involved in oral functions through the high activity of the surrounding organs.

We performed reconstructions in the patients with the greatest range of excision of the organs essential for the stomatognathic system. The most significant functions for the aforementioned system had poor outcome and the improvement was slow. Absence of the patients on the following oncologic appointments was a limitation for our outcomes.

The examination at 3 months postoperative interfered with postoperative irradiation; the examination at 6 and 12 months postoperative was postponed by the less-disciplined patients due to lack of oral cavity discomfort, considering the fact that the patients could visit the doctor at the oncologic supervision at the irradiation center. Re-education of swallowing and speech rehabilitation was performed postoperatively at the Maxillo-Facial Surgery Clinic and at the Department of Imaging Diagnostics and Interventional Radiology. The patients were given written instruction to practice 'safe swallowing' and to improve efficiency of the oral cavity organs and facial muscles. Presence of the patients at the oncologic supervision which was substantial for the further rehabilitation allowed for the control and presumptive change of orders. According to Ekberg [10] and Kaizer [11], this also allowed for the contact with patients and their families and is an underestimated opportunity to improve the quality of oral nutrition in the patients with swallowing disturbances.

Absence of the patients during our further medical supervisions could be related with their lack of acceptance of their own appearance and the assessed oral functions. Current research that is being conducted by our team focuses on development of the relation between the psychological profile of the patients who had undergone oral cancer operation and the course of the functional rehabilitation of the oral cavity organs.

CONCLUSION

Self-assessment of chewing, swallowing and speech, as well as total oral function performed by the patients who had undergone subtotal or total glossectomy due to oral cancer was lower in elder patients treated surgically due to more clinical advanced tumor, and in patients who were surgically treated due to resection of the anterior part of the oral cavity including the anterior part of the mandibular arch.

Improvement of the total oral function assessment during the first year postoperative was more clear in the patients treated due to less clinical advanced tumor. The aforementioned improvement includes the patients who had undergone reconstruction, as well as those who had not.

The period of six months postoperative appeared to be the crucial time for psychological care, change in diet and logopedic supervision to all of the patients, taking into consideration the low number of the participants and low total oral function scores.

REFERENCES

1. Colangelo LA, Logemann JA, Rademaker AW. Tumor size and pretreatment speech and swallowing in patients with resectable tumors. *Otolaryngol Head Neck Surg.* 2000; 122: 653-661.
2. Ellabban MA, Shoaib T, Devine J, McMahon J, Morley S, Adly OA, et al. The functional intraoral Glasgow scale in floor of mouth carcinoma: longitudinal assessment of 62 consecutive patients. *Eur Arch Otorhinolaryngol.* 2013; 270: 1055-1066.
3. Goldie SJ, Jackson MS, Soutar DS, Shaw-Dunn J. The functional intraoral Glasgow scale (FIGS) in retromolar trigone cancer patients. *J Plast Reconstr Aesthet Surg.* 2006; 59: 743-746.
4. Pauloski BR, Rademaker AW, Logemann JA, Stein D, Beery Q, Newman L, et al. Pretreatment swallowing function in patients with head and neck cancer. *Head Neck.* 2000; 22: 474-482.
5. Schliephake H, Jamil MU. Prospective evaluation of quality of life after oncologic surgery for oral cancer. *Int J Oral Maxillofac Surg.* 2002; 31: 427-433.
6. Speksnijder CM, van der Glas HW, van der Bilt A, van Es RJ, van der Rijt E, Koole R. Oral function after oncological intervention in the oral cavity: a retrospective study. *J Oral Maxillofac Surg.* 2010; 68: 1231-1237.
7. Chuanjun C, Zhiyuan Z, Shaopu G, Xinquan J, Zhihong Z. Speech after partial glossectomy: a comparison between reconstruction and nonreconstruction patients. *J Oral Maxillofac Surg.* 2002; 60: 404-407.
8. Kimata Y, Sakuraba M, Hishinuma S, Ebihara S, Hayashi R, Asakage T, et al. Analysis of the relations between the shape of the reconstructed tongue and postoperative functions after subtotal or total glossectomy. *Laryngoscope.* 2003; 113: 905-909.
9. Hara I, Gellrich NC, Duker J, Schön R, Fakler O, Smelzeisen R, et al. Swallowing and speech function after intraoral soft tissue reconstruction with lateral upper arm and free flap and radial forearm free flap. *Br J Oral Maxillofac Surg.* 2003; 41: 161-169.
10. Ekberg O, Hamdy S, Woisard V, Wuttge-Hannig A, Ortega P. Social and psychological burden of dysphagia: its impact on diagnosis and treatment. *Dysphagia.* 2002; 17: 139-146.
11. Kaizer F, Spiridigliozzi AM, Hunt MR. Promoting shared decision-making in rehabilitation: development of a framework for situations when patients with Dysphagia refuse diet modification recommended by the treating team. *Dysphagia.* 2012; 27: 81-87.

Cite this article

Halczy-Kowalik L, Stecewicz M, Rzewuska A, Posio V, Margula D (2014) Changes in Oral Cavity Functions Assessment with the Use of the Functional Intraoral Glasgow Scale (FIGS) in Patients after Subtotal or Total Glossectomy. *JSM Dent* 2(3): 1035.