

Swallowing and speech of patients submitted to glossectomy due to tongue cancer: cases report

Deglutição e fala de pacientes submetidos à glossectomia devido ao câncer de língua: relato de casos

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ABSTRACT

The present study aimed to correlate the swallowing and speech impairment level of patients submitted to glossectomy due to tongue cancer. This is a cross-sectional observational case study carried out with seven patients, over 18 years of age, who underwent glossectomy as a treatment for tongue cancer. Patients who had neurological diseases or who had undergone other head and neck surgeries not related to tongue cancer were excluded from the study. Swallowing clinical evaluation was performed using the ASED (Avaliação de Segurança da Deglutição) protocol and classification of oral intake according to the FOIS scale. Speech assessment was performed using the MBGR (Marchesan, Berrentin-Felix, Genaro, Rehder) protocol. It was observed that the major changes in swallowing occurred in the oral phase of swallowing, requiring changes in feeding practices with an impact on the level of oral intake. The following speech changes were mostly found: distortion in lingual-alveolar phonemes /t/ and /l/ and lingual-palatals /s/, /z/, /ʃ/, /ʒ/ and articulatory inaccuracy. A correlation was found between swallowing changes and oral food intake level and speech changes, demonstrating that the greater the feeding changes, the greater the speech changes found in the individuals of the present investigation.

Keywords: Speech therapy; Deglutition disorders; Mouth neoplasms; Glossectomy; Speech disorders

RESUMO

Este estudo teve como objetivo correlacionar o grau de comprometimento da deglutição e da fala de pacientes submetidos à glossectomia devido ao câncer de língua. Trata-se de um estudo de casos, de caráter transversal observacional, realizado em sete pacientes, com idade acima de 18 anos, que realizaram glossectomia como tratamento do câncer de língua. Foram excluídos da pesquisa pacientes que possuíam doenças neurológicas, ou que realizaram outras cirurgias de cabeça e pescoço, não relacionadas ao câncer de língua. Foi realizada avaliação clínica da deglutição, por meio do protocolo Avaliação de Segurança da Deglutição (ASED) e classificação da ingestão oral, conforme a Escala Funcional de Ingestão por Via Oral (*Functional Oral Intake Scale* - FOIS). A avaliação da fala se deu por meio do protocolo MBGR (Marchesan, Berrentin-Felix, Genaro, Rehder). Observou-se que as maiores alterações na deglutição ocorreram em fase oral da deglutição, havendo necessidade de modificações na alimentação, impactando o nível de ingestão oral. As alterações de fala mais encontradas foram distorção nos fonemas linguoalveolares /t/ e /l/ e linguopalatais /s/, /z/, /ʃ/ e /ʒ/ e imprecisão articulatória. Houve correlação entre as alterações de deglutição e o nível de ingestão oral e as alterações de fala, demonstrando que, quanto maiores as modificações presentes na alimentação, maiores as alterações de fala encontradas nos indivíduos do presente trabalho.

Palavras-chave: Fonoaudiologia; Transtornos da deglutição; Neoplasias bucais; Glossectomia; Transtornos da fala

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Conflict of interests: No.

Authors' contribution: MLB bibliographic review, data collection and analysis, final writing of the article; LJJ conception and methodological design of the study; CTM conception and methodological design of the study, bibliographic review, data analysis, final writing of the article.

Funding: None.

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Received: May 02, 2019; **Accepted:** February 25, 2020

INTRODUCTION

Cancer of the oral cavity covers tumors of the tongue, mouth floor, gums, jugal mucosa and hard palate. According to the *Instituto Nacional do Câncer* (INCA, National Cancer Institute), the estimate of new cases of oral cavity cancers in 2018, was 11,200 new cases for men and 3,500 for women. The main risk factors are associated with smoking and drinking, and when combined, they increase the chance of acquiring the disease. Poor diet, genetics, poor oral hygiene and the HPV virus are also listed among the risk factors^(1,2).

To select the therapy, it is necessary to determine the cancer staging, which objective is to assess the degree of the disease spread. The most used treatments are surgery, radiotherapy (RTX) and chemotherapy (QTX). Considering the functions of the oral cavity, such as chewing, swallowing and speech, the choice of the treatment used must take into account several factors, in order to ensure quality of life, as well as favoring survival⁽³⁾.

The effects on speech and swallowing in individuals who undergo surgery are heterogeneous and vary according to the resection location and type of reconstruction. The literature shows that, in individuals undergoing glossectomy, there is an increase in the oral transit time, in swallowing, and in the amount of residues remaining in the oral cavity, with worsening of the efficiency of swallowing and a reduction in the percentage of patients qualified for the intake of soft and solid food after surgery. In addition, there is a worsening of speech intelligibility and a significant reduction in the correct production of phonemes, without recovery over time⁽⁴⁾.

In view of the consequences of oncological surgery for the treatment of tongue cancer, speech disorders may be related to swallowing impairment. Therefore, the aim of the present study was to describe changes in swallowing and speech in patients undergoing glossectomy due to tongue cancer, besides correlating the level of oral intake and changes in swallowing with the speech disorders of these individuals.

INTRODUCTION OF THE CLINICAL CASE

This is a cross-sectional observational study, approved by the *Comitê de Ética em Pesquisas com Seres Humanos* (CEPSH, Research Ethics Committee with Human Beings) (Opinion Number: 1.939.138) of the *Universidade Federal de Santa Catarina*. All patients were informed about the research objectives and signed the Free and Informed Consent Form (FICF) to perform the procedures and for the use of the data.

The study included adult patients, over 18 years of age and elderly patients of both genders, who had undergone glossectomy as a treatment for tongue cancer. The study started at least 45 days after patients' surgery and, when they were treated with chemotherapy (QTX) and radiotherapy (RTX), 45 days after the last session⁽⁵⁾. The exclusion criteria included patients who had neurological diseases or who underwent other head and neck surgery, unrelated to tongue cancer.

Seven patients met the inclusion criteria; they were aged between 35 and 79 years, with a mean of 56.28 years (SD=+13.37 years) and were all male. Six of them reported being former smokers. The number of cigarettes smoked per day ranged from nine to 60 and the time of exposure to the addiction ranged from ten to 54 years.

As for the location of the tumor, all patients underwent border of the tongue resection. Data on age, habit, histological type and tumor location are shown in Table 1.

Regarding treatment, all patients underwent partial glossectomy. In addition to surgery for cancer treatment, four patients underwent RTX, two patients underwent QTX and one patient did not undergo adjuvant treatment. The number of RTX sessions ranged from 28 to 35. The radiation dose ranged from 60 to 67 Gys for three patients and, for the others, these data were not reported in the medical record. Cervical emptying was performed in five patients (P1, P3, P4, P5 and P6). A total of six (P1, P2, P4, P5, P6 and P7) of the seven patients had previously undergone speech therapy.

All the individuals underwent speech therapy assessments at least 45 days after medical treatment. Data collection was carried out through the clinical evaluation of swallowing and speech, while patients' characterization data (surgery, treatment with RTX and QTX, tumor staging at the time of treatment and tumor location) were obtained from the medical record.

To evaluate swallowing, a clinical evaluation was performed using the Swallowing Safety Assessment protocol (ASED - Avaliação de Segurança da Deglutição)⁽⁶⁾, used for structural, vocal and functional swallowing evaluation, in which the liquid, pudding and solid consistencies were used, to check for clinical signs of penetration/aspiration. When present, changes in the oral and pharyngeal phases were scored for statistical analysis. The final score was determined by the sum of the changes present in all consistencies.

The investigation of oral intake was carried out using the 24-hour food record. Patients were classified according to the levels of the Functional Oral Intake Scale (FOIS)⁽⁷⁾, considering the characteristics of the diet, based on the properties and texture of the food. Levels range from 1 to 7, with level 1 referring to

Table 1. Description of individual data regarding cigarette use, neck dissection and information about the tumor

Name	Age (years)	Cigarettes / day	Histological type	Tumor location	Cervical dissection
P1	53	15	SCC	Anterior lip and floor of the mouth	Yes (to the left)
P2	51	60	SCC	Tongue edge	No
P3	79	2 pipes	SCC	Anterior tongue edge	Yes (N/I)
P4	62	3 straw	SCC	Lateral tongue edge	Yes (to the left)
P5	35	0	SCC	Lateral tongue edge	Yes (to the left)
P6	53	8	SCC	Anterior tongue edge	Yes (N/I)
P7	61	60	SCC	Lateral tongue edge	No

Subtitle: P = patient; SCC = squamous cell carcinoma; N/I = not informed

nothing by mouth (NPO) and level 7 referring to patients on a total oral diet without any dietary restrictions.

Speech assessment was performed using the MBGR (Marchesan, Berrentin-Felix, Genaro, Rehder) protocol⁽⁸⁾, that allows assessment of the anatomical and functional conditions of the stomatognathic system. From this protocol, only the assessment related to speech was performed, which consisted of five tests: test 1: automatic speech, counting from zero to 20, uttering the days of the week and months of the year; test 2: nomination of 50 figures contained in the protocol; test 3: speech motor coordination, patients were asked to make rapid and repeated emission of the sounds [pa],[ta],[ka],[pataka]; test 4: spontaneous speech, using questions, such as “say your name and how old you are”, “say what you do” (study, work); test 5: repetition of 34 words, phonetically balanced, contained in the protocol. The score of the individual tests was obtained by adding the changes observed. The changes present in all tests were then added up to determine the final score.

All the tests were recorded on video using a digital camera, CANON brand, model SD1200 IS, supported on a table tripod, one meter away from the patient, who was framed between the shoulders and head, for the analysis of phonetic aspects.

Thus, the data obtained through swallowing and speech assessments were tabulated in a specific database for application of the relevant statistical test. Correlation between the results of the clinical evaluation of swallowing, FOIS and speech were analyzed using the Spearman correlation test, considering a value of $p \leq 0.05$. The correlation between clinical assessment of swallowing and speech evaluation was carried out taking into account the changes present in the use of all food consistencies in the oral phase, pharyngeal phase and in their sum.

In the functional evaluation of swallowing, five patients experienced changes at some point in the clinical evaluation.

In the oral phase, four patients showed changes, with residues in the oral cavity prevailing. In the pharyngeal phase, two patients had a cough and clearing of throat in the intake of liquid consistency food, one of whom had ineffective laryngeal elevation and positive cervical auscultation. Three patients had a cough and/or throat clearing after intake of pudding consistency food and no changes were observed with solid food. It was found that patients 1 and 2 did not consume solids at the time of the assessment (Table 2).

Regarding the patients’ oral intake level, three had classifications level 5, one patient, level 6 and three patients, level 7 (Figure 1).

In the speech evaluation, most of the individuals presented changes; the most frequent changes were distortion in the liquid phonemes /t/, /l/, in the fricatives /s/, /z/, /ʃ/ and /ʒ/ and articulatory inaccuracy. The individual data of the altered phonemes and the sum of the changes yielding the final score are shown in Table 3.

From the results, a correlation was made between the data on swallowing changes and the final score of the speech tests, using the Spearman correlation test, in which a correlation between the changes in the oral phase was verified ($p=0.055$), pharyngeal phase ($p=0.039$) and the sum of the changes found in the phases (0.028), considering all the food consistencies tested, demonstrating that the greater the presence of changes in swallowing, the higher the score in the speech tests.

The correlation analysis between FOIS and the speech score showed a negative correlation with a p-value of 0.039, indicating that the greater the speech changes, the lower the classification in the level of oral intake. The correlation data are described in Table 4.

Table 2. Individual results of changes present in the swallowing oral and pharyngeal phases, from the functional evaluation of swallowing using the swallowing safety assessment protocol, according to the food consistencies tested

ASED																					
	P1	P2	P3	P4	P5	P6	P7	P1	P2	P3	P4	P5	P6	P7	P1	P2	P3	P4	P5	P6	P7
	Liquid							Pudding							Solid						
ORAL PHASE																					
Capture	E	E	E	E	E	E	E	E	E	E	E	E	E	E	NR	NR	E	E	E	E	E
Sealing	E	E	E	E	E	E	E	E	E	E	E	E	E	E	NR	NR	E	E	E	E	E
Preparation	E	E	E	E	E	E	E	E	E	E	E	E	E	E	NR	NR	E	E	E	E	E
Exhaust	A	A	A	A	A	A	A	A	A	A	A	A	A	A	NR	NR	A	A	A	A	A
OTT	E	NE	E	E	E	E	E	E	E	E	E	E	E	E	NR	NR	NE	E	E	E	E
Coord.	E	NE	E	E	E	E	E	E	NE	E	E	E	E	E	NR	NR	E	E	E	E	E
Res. in OC	A	A	A	A	A	A	A	A	A	A	A	A	A	A	NR	NR	P	P	A	P	A
Pharyngeal phase																					
Laryngeal elevation	NE	E	E	E	E	E	E	E	E	E	E	E	E	E	NR	NR	E	E	E	E	E
Cough	P	P	A	A	A	A	A	A	P	A	A	A	A	A	NR	NR	A	A	A	A	A
Dyspnea	A	A	A	A	A	A	A	A	A	A	A	A	A	A	NR	NR	A	A	A	A	A
Wet voice	A	A	A	A	A	A	A	A	A	A	A	A	A	A	NR	NR	A	A	A	A	A
Clearing	P	P	A	A	A	A	A	P	P	P	A	A	A	A	NR	NR	A	A	A	A	A
Discomfort	A	A	A	A	A	A	A	A	A	A	A	A	A	A	NR	NR	A	A	A	A	A
Auscultation	+	-	-	-	-	-	-	-	-	-	-	-	-	-	NR	NR	-	-	-	-	-

Subtitle: ASED = swallowing safety assessment; P (1,2,3,4,5,6,7) = patient; OTT = oral transit time; Coord. = coordination between oral and pharyngeal phases; Res. in OC = residue in oral cavity; E = efficient; NE = not efficient; A = absent; P = present; NR = not performed; - = negative cervical auscultation; + = positive cervical auscultation

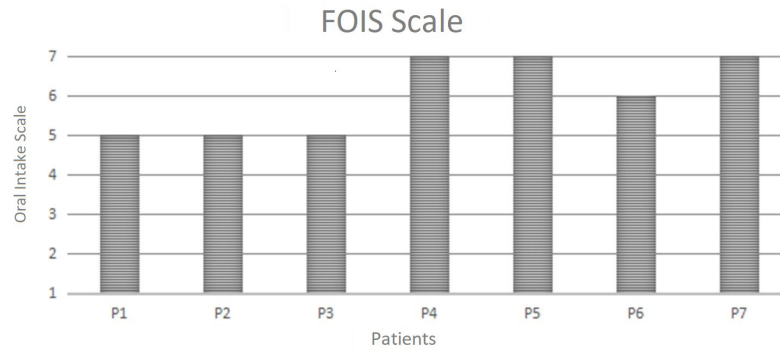


Figure 1. Individual results of the classification of patients' oral intake level using the Functional Oral Intake Scale.
Subtitle: FOIS = Functional Oral Intake Scale

Table 3. Individual results of the classification of speech alteration, changed phonemes and final speech score, assessed by means of orofacial myofunctional assessment - MBGR protocol

Patient	Speech classification	Changed phonemes	Final speech score
P1	Changed	/t/	10 points
P2	Changed	/t/, /l/, /k/, /g/	18 points
P3	Changed	/t/, /l/, /s/, /z/	11 points
P4	Adequate	None	0 points
P5	Adequate	None	0 points
P6	Changed	/t/, /l/, /s/, /z/, /ʒ/	14 points
P7	Changed	/s/, /z/	8 points

Subtitle: MBGR = Marchesan, Berrentin-Felix, Genaro, Rehder

Table 4. Values of r and p obtained through Spearman's correlation test to analyze the variables of the changes present in the swallowing tests and the final speech score, considering a significant correlation when the p value was ≤ 0.05

Swallowing proof test	Speech proof test	r value	p value
Oral phase	Final score	0.458	0.055
Pharyngeal phase		0.489	0.039
Sum of changes		0.518	0.028
FOIS		-0.778	0.039

Subtitle: FOIS = Functional Oral Intake Scale; r = Spearman's correlation coefficient; p = p-value

DISCUSSION

This study aimed to describe swallowing and speech disorders in patients undergoing glossectomy due to tongue cancer. The findings regarding the histological type, prevalence between men and women and the site affected by cancer are in line with data from the Brazilian literature, taking into account histological type, gender, age and habits. The literature has shown that the most common oral cavity histological type of cancer is the squamous cell carcinoma (SCC), responsible for more than 90% of cases, with the most affected sites being the tongue and the floor of the mouth. Still, the disease affects mainly the male gender, in the age group above 50 and, among the main risk factors are smoking and alcohol consumption, in addition to genetic factors, socioeconomic conditions and the HPV virus^(1,2).

All the individuals in the present study underwent surgery and the majority underwent neck dissection (ND) and RTX as a medical treatment for the tumor. Surgery has been described as the therapeutic modality used for the local control of the disease. Glossectomy can cause functional problems because

the tongue plays a fundamental role in swallowing and speech. The impairment of these functions is linked to the extent and location of the resection, the function of the remaining part of the tongue, the cancer staging and the ganglion damage⁽⁹⁾.

Considering that in all cases glossectomy was used as a treatment modality, dysphagia occurs due to extensive tissue loss, limitation of the remaining tissue excursion, decreased mobility and sensitivity of the tongue, soft palate and pharynx⁽¹⁰⁾. A study by Son et al.⁽¹⁰⁾ in 133 patients who underwent glossectomy, found that significant changes after surgery included inadequate control of the tongue, mastication and increased oral transit time, in addition to aspiration, residues in the pharynx and inadequate elevation of the larynx, visualized through swallowing videofluoroscopy. These findings are in line with the data of the present study, and the highest frequency of changes found in the clinical evaluation of swallowing occurred in the oral phase, with a higher incidence of residues in the oral cavity after swallowing.

The severity of dysphagia in patients undergoing glossectomy will depend on the extent of the resection, the mobility of the remaining structure, the type of reconstruction, the impairment of adjacent structures and the motivation and adaptation of the patient

with the result of the surgery⁽¹¹⁾. In a study by Huang et al.⁽¹²⁾ in 112 patients who underwent glossectomy of different surgical extensions, it was observed that patients who underwent tongue resection greater than 50% had a higher risk of aspiration when swallowing, when compared to those who underwent minor resections, that is, partial glossectomy influenced patients' swallowing to a lesser extent. This finding also agrees with the data of the present study, since all patients underwent partial glossectomy, with less than 50% tongue resection and only two patients showed clinical signs of penetration / aspiration during the clinical evaluation of swallowing.

The limitation of oral intake resulting from difficulty in propelling the food bolus is common in postoperative patients with head and neck cancer, indicating severe oropharyngeal dysphagia, even without signs of aspiration⁽¹³⁾. In the study by Hey et al.⁽¹³⁾ with 80 patients with cancer of the oral cavity, oropharynx and hypopharynx, it was found that 56.3% of the patients exhibited an oral intake level lower than or equal to 4. The outcome of the present study also showed that the majority (n=4) of the patients presented some limitation in oral intake, but none of them below level 4. The results found may have been divergent due to the fact that the swallowing evaluation of the patients in this study occurred in the late postoperative period (mean of 3.6 years), a period in which patients already make their own swallowing adaptations, such as alternating consistencies during feeding and restricting solid food.

In the present study, most of the individuals presented speech disorders, the most frequent of which were distortion of the lingual-alveolar phonemes (/t/ and /l/), linguo-palatine phonemes (/ʃ/, /z/ and /k/) and articulatory inaccuracy. The location of the resection is related to the alteration of these phonemes, since most patients underwent resection on the lateral edge of the tongue, a region necessary for the production of linguo-palatine phonemes (/ʃ/, /z/ and /k/). These findings are in line with the study by Jaya et al.⁽¹⁴⁾, who found that, after surgery in individuals with tongue cancer, the most frequent speech errors were substitution, distortion and omission of bilabial, lingual-alveolar and linguo-palatine phonemes, in addition to impaired speech intelligibility.

The results of the present study demonstrated that the greater the change in swallowing and in the level of food oral intake, the greater the change in speech. This is due to the fact that the tongue is a fundamental structure, both in swallowing and in speech, being responsible for the control and ejection of the food bolus, lateralization during chewing, protection of the airways, in addition to being one of the main articulators of speech⁽¹⁵⁾. In the study by Hey et al.⁽¹³⁾, it was found that dysglossia, "wet voice", mobility and tongue strength, observed during the clinical evaluation, had a significant correlation with the limitation of oral intake and, except for dysglossia, with aspiration, demonstrating the importance of clinical parameters of oral and laryngeal functions unrelated to swallowing as predictors of limited oral intake and aspiration.

Although the present study has yielded significant results in correlating its findings, the small number of patients was a limitation. However, the instrumental assessment of swallowing could assist in the objective analysis of its biodynamics aspects, related to time, coordination and amplitude of movement and their correlations with the findings of speech biodynamics.

FINAL COMMENTS

The individuals in the present study, who underwent glossectomy due to tongue cancer, showed greater changes in the oral phase of swallowing and changes in the diet, with an impact on the level of oral intake. The most common speech disorders were distortion and articulatory inaccuracy. A correlation between swallowing changes and the level of oral intake and speech changes was found, demonstrating that the greater the changes present in the food intake, the greater the speech changes.

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