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Assessment of the gustatory function in patients with advanced oral cavity and oropharyngeal cancer

Avaliação da função gustativa em pacientes com câncer de cavidade oral e orofaringe avançado

Keywords

Taste Disorders
Mouth Neoplasms
Speech Therapy

Descritores

Distúrbios do Paladar
Neoplasias Bucais
Fonoterapia

ABSTRACT

Purpose: The changes in gustatory function resulting from oncological treatment occur mainly after radiotherapy. However, the head and neck tumors, because of the anatomical location of the lesion, can themselves trigger significant changes in the feeding-related functions – including taste. To assess the gustatory function in patients diagnosed with advanced oral cavity and oropharyngeal cancer. **Method:** This descriptive cross-sectional study comprised 31 individuals with advanced oral cavity and oropharyngeal cancer, referred for oncological treatment with radiotherapy, either alone or in combination with chemotherapy. The “taste strips” test was applied; it consists of inserting solutions with four different concentrations each for salty, sweet, and sour tastes, and three concentrations for the bitter taste, on the tongue. **Results:** Most of the individuals were diagnosed with oropharyngeal cancer. Approximately half of the sample already had taste-related complaints, and more than 80%, swallowing-related complaints. The overall frequency of hypogeusia was 38.7%, in which the bitter taste stood out in its isolated assessment. The association of change in gustatory function proved to be significant in patients in stage T4. **Conclusion:** The decrease in gustatory function in individuals with oral cavity and oropharyngeal cancer was evidenced in this study, especially when associated with tumors in stage T4. Regarding feeding, most of them reported complaints of dysphagia, suggesting the importance of the speech-language-hearing assessment and follow-up, even before the oncological treatment, to minimize the risks of dysphagia.

RESUMO

Objetivos: As alterações na função gustativa decorrentes do tratamento oncológico ocorrem, principalmente, após a radioterapia, no entanto, os tumores de cabeça e pescoço, pela própria localização anatômica da lesão, podem, por si só, desencadear alterações significativas nas funções relacionadas à alimentação, dentre elas o paladar. Avaliar a função gustativa em pacientes diagnosticados com câncer de cavidade oral e orofaringe avançado. **Método:** Trata-se de um estudo transversal de caráter descritivo, desenvolvido com 31 indivíduos com câncer de cavidade oral e orofaringe em estágio avançado, encaminhados para tratamento oncológico exclusivo com radioterapia ou associado à quimioterapia. Foi aplicado o “taste strips”, que consiste na inserção de soluções com quatro concentrações distintas para cada um dos sabores salgado, doce e azedo e três concentrações para o amargo, sobre a língua. **Resultados:** A maioria dos indivíduos foi diagnosticada com câncer de orofaringe, sendo que, aproximadamente, metade da amostra já apresentava queixas quanto ao paladar e mais de 80%, queixas para deglutição. A frequência geral de hipogeusia foi de 38,7%, com destaque para o sabor amargo na sua avaliação isolada. A associação da alteração na função gustativa mostrou-se significativa em pacientes com estadiamento T4. **Conclusão:** A diminuição da função gustativa em indivíduos com câncer de cavidade oral e orofaringe foi evidenciada neste estudo, principalmente quando associado a tumores com estadiamento T4. Quanto à alimentação, a maioria relatou queixas disfágicas, sugerindo a importância da avaliação e acompanhamento fonoaudiológico antes mesmo do tratamento oncológico, de modo a minimizar os riscos disfágicos.

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INTRODUCTION

Mouth cancer is one of the most frequent types of head and neck tumors, and the fifth among the types of cancer with the highest incidence in men (5.2%)⁽¹⁾. Tumors in the oral cavity are diagnosed with this name when the lesions affect the lips and the inside of the oral cavity (gingivae, buccal mucosa, hard palate, tongue, and floor). The oropharyngeal tumors, in their turn, develop on the base of the tongue, soft palate, tonsils, tonsillar pillars, and lateral and posterior pharyngeal walls⁽²⁾.

The American Cancer Society⁽³⁾ estimates that approximately 51,540 new cases of oral cavity and oropharyngeal cancer were diagnosed in the United States in 2018, with a survival rate of approximately five years. In Brazil, the estimates were of 11,200 new cases of oral cavity and oropharyngeal cancer in men, and 3,500 in women, a year in the 2018-2019 biennium⁽⁴⁾. These numbers correspond to an estimated risk of 10.86 new cases for every 100 thousand men and 3.28 for every 100 thousand women and the estimate of 5,401 deaths in 2013 – 4,223 men and 1.178 women⁽¹⁾.

Smoking, alcohol consumption, and HPV infections (especially with types 16 and 18) are considered the main risk factors for this group of tumors⁽⁴⁾. The risk of developing oral cavity cancer due to alcohol consumption and smoking corresponds to 65% on average, and when the two habits are combined, synergism occurs^(1,5).

The oncological treatment of head and neck neoplasias is based on three approaches: surgery, radiotherapy, and chemotherapy – which can be used either alone or in combination. Regarding radiotherapy, sequelae such as xerostomia, rampant caries, mucositis, osteoradionecrosis, infection, trismus, stomatitis, nutritional repercussions, and dysgeusia can appear either immediately or throughout the treatment, and even months or years after finishing it^(6,7).

Changes in gustatory function resulting from the oncological treatment usually take place after radiotherapy^(6,7,8). However, head and neck tumors, due to the anatomical location of the lesion, can themselves trigger significant changes in feeding-related functions, including taste⁽⁹⁾.

Gustatory recognition occurs through the sensory perception in the taste buds present in the papillae of the tongue, soft palate, epiglottis, pharynx, and larynx^(10,11). Concerning the tongue, the sweet and salty tastes are recognized mainly on the anterior part of the tongue, while the sour is perceived on both lateral surfaces, and the bitter, on the posterior portion of the tongue and soft palate⁽¹¹⁾. The proprioceptive sensitivity is furnished by the lingual, glossopharyngeal, and upper laryngeal nerves, which carry the sensations of touch, temperature, and position, as well as the gustatory impressions that enable the person to appreciate the quality and taste of foods in the oral cavity⁽¹⁰⁾.

Although the oral phase of swallowing is voluntary, it depends on the integration of mechanical (through contact with food) and chemical stimuli (through smell and taste), which help to prepare the oral and gastrointestinal motor systems to receive the food⁽¹¹⁾. In oncological individuals, external factors such as xerostomia and olfactory reduction can interfere with the

gustatory function, with a direct impact on swallowing and repercussions on these people's nutrition and quality of life⁽⁸⁾.

Smoking, also reported in the literature as an agent that affects the gustatory function, is a factor that influences taste differentiation. This suggests that the smokers' gustatory recognition is not as good as that of nonsmokers, making it necessary to increase the concentration of the proposed stimulus for the taste to be properly recognized⁽¹¹⁾.

Given these circumstances, this study aimed to assess the gustatory function in patients diagnosed with advanced oral cavity and oropharyngeal cancer, describing complaints related to taste and swallowing (feeding route), assessing the identification of sweet, salty, sour, and bitter tastes, and classifying the gustatory function in this profile of patients as ageusia, hypogeusia, and normogeusia, before radiotherapy treatment, besides relating the changes in the gustatory function with factors such as sex, age group, staging, and risk factors (smoking and alcohol consumption, both alone and in combination).

METHOD

This descriptive cross-sectional study was developed between May and September 2018 in the Speech-Language-Hearing and Radiotherapy Departments of the *Hospital de Câncer de Pernambuco* - HCP. This research has been approved by the Research Ethics Committee of HCP under evaluation report no. 2.447.793.

The study sample comprised volunteers aged 18 years or older, of both sexes, diagnosed with advanced oral cavity or oropharyngeal cancer (with no surgical intervention), before the oncological treatment with radiotherapy, either alone or in combination with chemotherapy, receiving care at the Speech-Language-Hearing outpatient center and/or Radiotherapy Department of the *Hospital de Câncer de Pernambuco*. The patients were identified through the radiotherapy service waiting list and assessed before the first session.

Regarding the exclusion criteria, the following subjects were dismissed from the research: those with neurological and cognitive problems that hindered them from understanding simple orders; those that had used or were using (during the assessment period) medications and/or chemotherapeutic drugs (such as carboplatin, cisplatin, cyclophosphamide, doxorubicin, fluorouracil, methotrexate, levamisole, and vincristine⁽¹²⁾) that could trigger changes in the gustatory function; those with extensive ulcerative lesions throughout the tongue; those with a history of oral cavity or oropharyngeal resection; and those that underwent speech-language-hearing treatment for gustatory function rehabilitation (verified from the data in the medical records).

Hence, the convenience sample in this research comprised 31 subjects, selected according to the inclusion and exclusion criteria. Six of them had been diagnosed with an oral cavity tumor and 25, with an oropharyngeal tumor. All the volunteers were instructed about the objectives of the research and were asked to sign the informed consent form (ICF).

The data collection began with the anamnesis protocol (Appendix A) and subsequent assessment of gustatory sensitivity

and taste identification. To this end, the adapted Chemical Gustometry method was applied, whose approach is to use sodium chloride solutions for salty; sucrose for sweet; citric acid for sour; and quinine sulfate for bitter taste. Quinine sulfate was replaced with caffeine, based on a recent study⁽¹³⁾ that contraindicates its use, and due to the absence of drugstores capable of manipulating the substance.

The instrument of the research was based on the “taste strips” test (Annex I), validated by Muller⁽¹⁴⁾. It consists of inserting solutions with four different concentrations each for the salty, sweet, and sour tastes; and three different concentrations for the bitter taste. All of them are administered in 8-cm-long filter paper strips with an area of 2 cm. Two strips with distilled water (tasteless) are added to each test to validate the study.

The following concentrations were used: sour (citric acid) – 0.3 g/mL, 0.165 g/mL, 0.09 g/mL, and 0.05 g/mL; bitter (caffeine) – 0.05 g/mL, 0.1 g/mL, and 0.2 g/mL; sweet (sucrose) – 0.4 g/mL, 0.2 g/mL, 0.1 g/mL, and 0.05 g/mL; salty (sodium chloride) – 0.25 g/mL, 0.1 g/mL, 0.04 g/mL, and 0.016 g/mL.

The strips were positioned approximately 1.5 cm away from the tip of the tongue, and the test began with the lowest concentration. Two drops of each taste were applied, with a contact time of 10 seconds. The volunteer was asked to report whether the taste was present or not and, if so, what taste that was. After each strip’s assessment, they were instructed to rinse out their mouth with water to remove any residues.

All the tastes were tested administering the strips in the growing order of concentration. The participant was invited to choose, for each of the strips, one of the five options: bitter, sour, sweet, salty, or tasteless. For every correctly identified strip, the person scored a point, whereas the tasteless strips and the incorrect answers – either for mistakenly identifying the taste, or not identifying it at all – did not get any points. Thus, the maximum score was 15 points.

Following the test recommendation, the taste assessment took place at least one hour after the participant had eaten or drunk anything (except for water), smoked, or brushed their teeth.

Regarding the gustatory function, when the gustatory responses to the stimuli were absent, it was considered as ageusia; when the taste capacity was diminished, it was considered as hypogeusia; when the taste capacity was distorted, it was considered as dysgeusia; and when there were no significant changes in the gustatory function, it was considered normogeusia.

Hence, as proposed in the test, the cutoff score was set at nine correct answers out of the 15 concentrations tested – so that a total score equal to or below nine was categorized as hypogeusia, and one above nine was categorized as normogeusia. For the sweet, salty, and sour gustatory stimuli, the gustatory perception was classified as hypogeusia when the total correct answers were equal to or below two; as for the bitter gustatory stimulus, the total correct answers equal to or lower than one was considered hypogeusia.

The variables considered were the changes in gustatory function, tumor site and staging (TNM), sex, age group, smoking and alcohol consumption habits, and the feeding type and route.

The data were organized in an Excel® spreadsheet with a databank created exclusively for this research. The results were

analyzed with the STATA software, version 12.0 (Statistical Software for Professionals, StataCorp LP, UK), using the Pearson chi-square test, Fisher’s exact, and ANOVA test for the analysis.

RESULTS

Of the 79 patients collected from the waiting list, 11 (13.9%) deceased before the first radiotherapy session, two presented associated neurological impairment, two had extensive ulcerative lesions throughout the tongue, 18 had previously undergone resection surgery, and 15 were lost due to different factors, such as the radiotherapy rescheduled for either a later or earlier date. Therefore, 31 individuals comprised the sample.

Most of the patients were males (74.2%). As for age, a little more than half were older adults (51.6%), 45.2% were between 31 and 59 years old, and only one patient was younger than 31 years.

Regarding the origin of the cases, 45.2% were from the Recife metropolitan area. In terms of schooling level, most of those researched were characterized as illiterate (41.9%), while 35.5% had not finished middle school. Concerning habits, 90.3% of them smoked, 80.6% habitually consumed alcoholic beverages, and 77.4% had both habits (smoking and alcohol consumption) (Table 1). Only two patients (6.4%) reported xerostomia before the treatment.

Table 1. Sociodemographic characteristics of the patients diagnosed with advanced oral cavity and oropharyngeal cancer (n=31)

Characteristics	Number (%)
Sex	
Males	23 (74.2%)
Females	8 (25.8%)
Age group	
18 to 30 years	1 (3.2%)
31 to 59 years	14 (45.2%)
60 years or older	16 (51.6%)
Origin	
Metropolitan area	14 (45.2%)
Backcountry mesoregion of Pernambuco (Sertão)	5 (16.1%)
Coastal forest mesoregion of Pernambuco (Zona da Mata)	4 (12.9%)
Countryside mesoregion of Pernambuco (Agreste)	5 (16.1%)
São Francisco river mesoregion of Pernambuco	3 (9.7%)
Schooling level	
Illiterate	13 (41.9%)
Unfinished middle school	11 (35.5%)
Finished middle school	3 (9.7%)
Unfinished high school	4 (12.9%)
Habits	
Smoking	28 (90.3%)
Alcohol consumption	25 (80.6%)
Smoking + Alcohol consumption	24 (77.4%)

Describing the patients' clinical characteristics, 80.7% were diagnosed with oropharyngeal cancer, and 19.3%, with oral cavity cancer. A little more than half of those researched (51.6%) were in stage T4, whereas 10% had locoregional metastasis. All the patients had an indication for radiotherapy and 83.9%, for chemotherapy. The most frequent feeding route was oral with liquid/creamy consistency, while 83.9% of those researched reported complaints such as odynophagia and choking, among the most frequent ones. Only two patients (6.4%) had a tracheostomy, one reported respiratory complaint, and 13 (41.9%) had taste-related complaints in the pretreatment (Table 2).

Table 2. Clinical characteristics of the patients diagnosed with advanced oral cavity and oropharyngeal cancer (n=31)

Characteristics	Number (%)
Diagnosis	
Oral cavity cancer	6 (19.3%)
Oropharyngeal cancer	25 (80.7%)
Staging	
T2	6 (19.4%)
T3	9 (29.0%)
T4	16 (51.6%)
Metastasis	
Yes	2 (10.0%)
No	18 (90.0%)
It could not be assessed	11
Radiotherapy	31 (100%)
Chemotherapy	26 (83.9%)
Pretreatment feeding route	
Oral (Liquid and Liquid/Creamy)	18 (58.1%)
Oral (Creamy)	2 (6.4%)
Oral (Soft Solid)	5 (16.1%)
Oral (Free)	1 (3.2%)
Mixed Diet	1 (3.2%)
Nasoenteral Tube	3 (9.7%)
Gastrostomy	1 (3.2%)
Feeding-related Complaints	
No Complaints	5 (16.1%)
Odynophagia	12 (38.7%)
Choking	5 (16.1%)
Nasal Regurgitation	3 (9.7%)
Pain/Burning Sensation on the Tongue	1 (3.2%)
Trismus + odynophagia	2 (6.4%)
Choking + odynophagia	3 (9.7%)
Tracheostomy	2 (6.4%)
Respiratory Complaints	1 (3.2%)
Pretreatment Taste Complaints	13 (41.9%)

In the sample, 19 patients had normogeusia and 12, hypogeusia, or ageusia (Figure 1). Considering all the stimuli (overall), the frequency of hypogeusia was of 38.7% (95% CI: 22.7 to 57.6); in the sweet gustatory stimulus, the frequency was of 32.3%; in

the salty stimulus, the frequency of hypogeusia was of 29%; in the sour stimulus, it was of 19.3%; and in the bitter gustatory stimulus, the frequency of hypogeusia was of 80.6% (Figure 2).

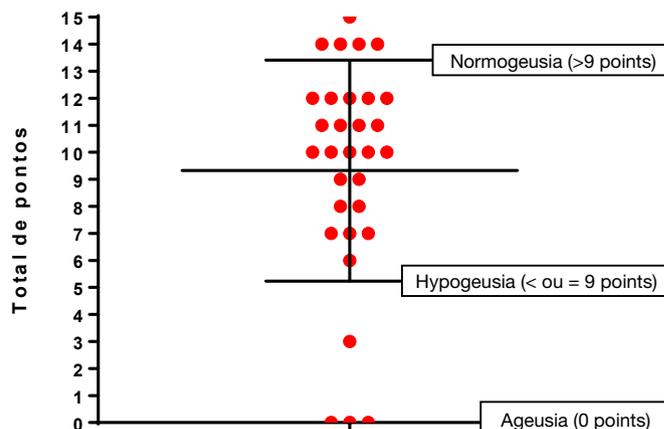


Figure 1. Distribution of the total score according to the "Taste Strips" test to classify the gustatory function in patients diagnosed with advanced oral cavity and oropharyngeal cancer (n=31)

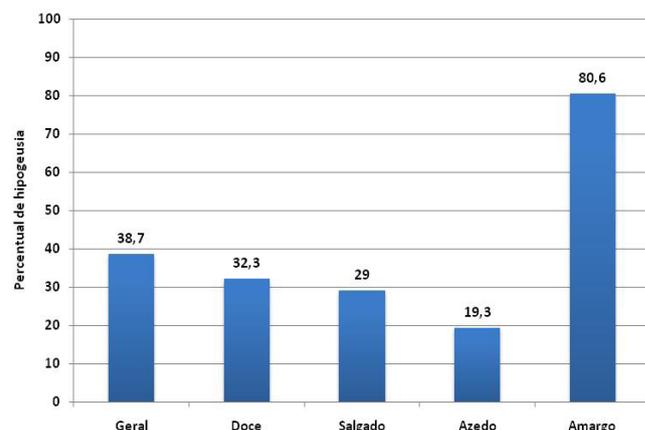


Figure 2. Frequency distribution of hypogeusia in the gustatory function in patients diagnosed with advanced oral cavity and oropharyngeal cancer (n=31)

In the analysis of the relationship between changes in the gustatory function and the factors studied, the staging was associated with a change in taste. In the group of patients in stage T4, there was a statistically significant ($p = 0.046$) higher frequency of hypogeusia, with an odds ratio of 2.27 (Table 3).

Table 3. Association of change in gustatory function with the biological and clinical factors of the patients diagnosed with advanced oral cavity and oropharyngeal cancer

Characteristics	Hypogeusia (n = 12)	Normogeusia (n = 19)	OR (95% CI)	p-value
Sex				
Females	3 (25.0%)	5 (26.3%)	Reference	
Males	9 (75.0%)	14 (73.7%)	1.07 (0.20 – 5.62)	0.935
Age group				
Under 60 years	5 (41.7%)	10 (52.6%)	Reference	
60 years and older	7 (58.3%)	9 (47.4%)	1.25 (0.60 – 2.58)	0.553

Table 2. Continuation...

Habits				
Smoking				
No	1 (8.3%)	2 (10.5%)	Reference	
Yes	11 (91.7%)	17 (89.5%)	1.29 (0.10 – 16.0)	0.841
Alcohol consumer				
No	3 (25.0%)	3 (15.8%)	Reference	
Yes	9 (75.0%)	16 (84.2%)	0.56 (0.09 – 3.39)	0.530
Diagnosis				
Oral Cavity Cancer	2 (16.7%)	4 (21.0%)	Reference	
Oropharyngeal Cancer	10 (83.3%)	15 (79.0%)	1.33 (0.20 – 8.70)	0.764
Staging				
T2/T3	3 (25.0%)	12 (63.2%)	Reference	
T4	9 (75.0%)	7 (36.8%)	2.27 (1.01 – 5.05)	0.046
Pretreatment Feeding Route				
Oral	9 (75.0%)	17 (89.5%)	Reference	
Others	3 (25.0%)	2 (10.5%)	2.83 (0.40 – 20.2)	0.298

DISCUSSION

The males and the age range from 45 to 69 years represent a world prevalence of affection with oral cavity and oropharyngeal cancer^(15,16). The data found in this study corroborate such findings.

The low schooling level (illiterates: 41.9%, and unfinished middle school: 35.5%) was the most frequent in the population studied, which coincides with previous studies⁽¹⁷⁾. These obtained a significant association between low schooling and mouth cancer.

Regarding the habits, smoking was predominant, followed by alcohol consumption and the combination of both, which confirms the data in the literature. It presents smoking, alcohol consumption, and HPV infection (especially with types 16 and 18) as the main risk factors for this group of tumors⁽⁴⁾, with synergism when smoking and alcoholism are combined^(1,3). In this sample, the HPV-positive analysis was not considered because most of the individuals had not been submitted to the tests, making it impossible to find an association.

Most of the time, oropharyngeal cancer is diagnosed late, and its incidence in Brazil is one of the highest in the world⁽¹⁸⁾. In the present study, the cases of oropharyngeal cancer were more frequent than the oral cavity ones, in advanced stage (T4), which was also verified in other studies⁽¹⁹⁾.

Such findings can explain the high rate of feeding-related complaints, particularly that of odynophagia and choking. These have also been observed in another study⁽²⁰⁾ that found a rate of 59% of individuals with complaints of dysphagia before the proposed treatment. Such circumstances suggest the importance and need for these patients' to be assessed and followed up by a speech-language-hearing therapist even before the radiotherapy, chemotherapy, or surgical resection.

The complaints of dysphagia in this profile of patients can be explained by the anatomical location of the lesion and the

delayed clinical and histological diagnosis in an advanced stage⁽²¹⁾. Hence, it is suggested that the food consistency be modified, or an alternative feeding route be used⁽²²⁾. It should be highlighted that the prolonged use of a nasogastric tube or another alternative feeding route other than the oral can have a negative impact on the gustatory function due to sensory deprivation⁽²³⁾.

Odynophagia can lead to difficulties in oral feeding, and the persistence of this symptom can cause weight loss, anorexia, cachexia, and dehydration⁽⁶⁾. Thus, studies^(24,25) show that speech-language-hearing assessment in patients with signs of dysphagia, or at risk of dysphagia, furnishes the differential diagnosis and the definition of the procedures to safely and effectively reintroduce and adjust the consistency of oral feeding, preventing complications, reducing hospital costs, enabling an earlier discharge, and even providing a better quality of life.

Concerning the gustatory function, almost half of the patients already had taste-related complaints, which can be due to the tumor site, the extension of the lesion, and the association with the smoking habit^(9,11). Even though it has less influence than smoking, alcohol consumption can also cause changes in taste, either through hypogeusia or a disagreeable sensation in taste perception⁽²⁶⁾. Xerostomia, despite being reported by only two patients in this study, is a factor of gustatory interference as well, as the saliva plays an important role in maintaining homeostasis in the oral cavity⁽²⁷⁾. Other studies also associate aging with the degeneration of the gustatory papillae, besides neuronal damages, which can trigger hypogeusia^(14,28).

The decrease in the gustatory function, characterizing hypogeusia, had strong evidence in the advanced oral cavity and oropharyngeal tumors (stage T4), with an odds ratio of 2.27 and statistical significance ($p = 0.046$), as well as the occurrence of changes in the distribution of the tastes, which characterizes one of the contributions of this study.

The frequency of hypogeusia for bitter taste was significantly higher when compared with the other tastes. It can be related to the impairment of the gustatory papillae in the base of the tongue, common in oropharyngeal tumors. The tastes are perceived through the taste buds diffusely located on the tongue dorsum, palate, epiglottis, pharynx, and larynx⁽²⁹⁾. Regarding the tongue, the bitter taste is obtained mainly in the posterior part; the sweet, in the anterior part; the sour, in the lateral parts; and the salty, in the tip of the tongue and adjacent lateral walls⁽²⁹⁾.

On the other hand, the sour stimulus had the least change, which can be explained by its integrating a mechanism to warn and protect the organism, associated with the rejection of certain foods⁽³⁰⁾.

The gustatory function in general directly influences and is influenced by the person's feeding and nutrition process⁽⁸⁾. Changes in taste can trigger loss of appetite, poor nutrition, and even malnutrition, having in the alternative enteral feeding route its cause (if prolonged use is needed due to dysphagia) or consequence (due to malnutrition, when the person refuses to feed orally). These factors are usually worsened during and/or after the radiotherapy or chemotherapy treatment⁽²⁴⁾.

CONCLUSION

This paper verified that approximately 42% of the individuals assessed already had taste-related complaints even before the radiotherapy treatment. Changes were noticed in the identification of all tastes assessed, although they were more frequent in hypogeusia for bitter. This can be related to the impairment of the gustatory papillae in the base of the tongue, common in oropharyngeal tumors.

The decrease in gustatory function (hypogeusia and ageusia) in individuals with oral cavity and oropharyngeal cancer was evidenced in this study, particularly when associated with tumors in stage T4. No significant associations were observed between the changes in gustatory function and sex, age group, or risk factor.

Concerning feeding, most of the patients reported complaints of dysphagia, with predominating symptoms of odynophagia and choking. Their diet was adjusted to a liquid/creamy consistency, which suggests the importance and necessity of speech-language-hearing assessment and follow-up, even before the oncological treatment, to minimize the risks of dysphagia.

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Authors' contribution

MDC: Conceptualization, investigation, formal analysis, and writing;
DSTJD: Project administration, formal analysis, and writing; RBA: Supervision, conceptualization, formal analysis, and writing.

Appendix A – Anamnesis Protocol

Adapted from Caldas (2011)

Date: __/__/____.

Name: _____ Age: _____

No. of registry: _____ Telephone: _____

Occupation: _____ City of residence: _____

DH: _____

HPV +: () Yes () No

1. Surgery: () Sim () Não Which? _____ - _____

2. Histopathological: _____

3. Staging: _____

4. Radiotherapy sessions: _____ Duration: _____ Finished on: _____
Place of treatment: _____

5. Combined chemotherapy? () Yes () No
Duration of the treatment: _____ Date when finished: _____

6. Combined Speech-Language-Hearing Therapy? _____

7. Sex: () Female () Male

8. Schooling Level:

- a) Illiterate
- b) Unfinished middle school
- c) Middle school
- d) Unfinished high school
- e) High school
- f) Unfinished higher education
- g) Higher education
- h) Postgraduation

9. Smoking: () Yes () No
Time with the habit: _____ Date when stopped smoking: _____

10. Alcohol consumption: () Yes () No
Time with the habit: _____ Date when stopped drinking: _____

11. Edentulous: () Yes () No () Prosthesis. Which? _____

12. Feeding route used before radiotherapy?
() Oral. What consistency? _____
() NET () GTT () PTN () Other. Which? _____

13. Has current taste-related complaints?
() No () Ageusia () Hypogeusia () Dysgeusia
() Other. Which? _____

14. Uses tracheostomy? () Yes () No Time: _____

15. Respiratory complaints: () Yes () No Which? _____

16. Previous history:
() Sinusitis () Rhinitis () Bronchitis () Nasal septum deviation
() Adenoid surgery () Asthma () Other. Which? _____

17. Taste impairment:
Before the radiotherapy:
() Unchanged
() Sweet
() Salty
() Sour
() Bitter

ANNEX I

Gustatory Function Assessment Protocol

(Adapted from Durham, 1991 and Muller et al., 2003)

Name: _____

Date of birth: __/__/____.

TASTE	SWEET/ Sucrose (g/mL)				SALTY/ Sodium Chloride (g/mL)				BITTER/ Caffeine (g/mL)			SOUR/ Citric acid (g/mL)			Water
	0,4	0,2	0,1	0,05	0,25	0,1	0,04	0,016	0,05	0,1	0,2	0,3	0,165	0,09	
Sim															
Não															