

Original Research Article

A time frame evaluation of the oral health-related quality of life among patients with head and neck cancer

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ABSTRACT

Background: We evaluated the oral health-related quality of life among patients with head and neck cancer.
Material and methods: The Oral Impact Profile (OHIP-14) questionnaire was applied at four distinct moments of antineoplastic therapy. The influence of oral mucositis (OM) severity and associated oral pain were measured during the radiotherapy.
Results: Twenty-four patients were followed up from 6 to 18 months. Functional limitation had worsened since radiotherapy started and remained so after its completion, impairing the patients' quality of life. Physical pain increased during radiotherapy. The overall impact on quality of life was affected by radiotherapy while dental treatment caused no damage. There was a significant positive correlation between pain and OM severity. Head and neck cancer treatment impacted oral health-related quality of life.
Conclusion: This understanding can orientate the progress of preventive approaches and more resolute and extensive treatments focusing not only in solving oral problems, but also pondering their impact on the cancer survivors.

1. Introduction

According to the World Health Organization (WHO), quality of life (QoL) is defined as individual perception of life, values, goals, standards, and interests in the framework of culture [1]. This broad ranging concept is influenced by the person's physical health, psychological state, level of independence, social relationships, and their relationship to the environment. Thus, the general well-being of individuals can be estimated by QoL assessment instruments. Particularly for malignancies, their use has been increasing as a measure to guide treatment choices, offering a more personalized treatment to the individual [2–5].

Oral Health Impact Profile (OHIP-14) is a questionnaire elaborated by Slade [6] that assesses the impact of oral health conditions on patients' QoL. It has already been applied to heart transplanted patients [7], to xerostomic patients due to antineoplastic therapy in the head and neck region [8], and also to patients with hematological malignancy preceding the hematopoietic stem cell transplantation (HSCT) [9].

OHIP-14 is considered an instrument of validity and effectiveness in a clinical setting [10], besides being easy to apply and have low cost, thus allowing easy access to the population.

Besides, head and neck tumors and its treatment have long been known to cause serious changes in the oral cavity impairing basic functions, such as speech, swallowing, chewing, and salivation [2,3,11]. For instance, oral mucositis (OM) (one of the main oral complications of oncologic treatment characterized by mouth ulcers and pain) is managed with opioid analgesics at severe stages and strongly affects the QoL in cancer population [12,13]. Therefore, the dental evaluation and treatment prior to antineoplastic therapies are critical to maintaining or improving the QoL, especially among patients with cancer of the head and neck [14].

The intense pain that is associated with grade III or IV OM (WHO) in patients irradiated with head and neck tumors may be responsible for the interruption of antineoplastic treatment (both chemotherapy and radiotherapy). In cases of severe pain, the patient will not be able to eat

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or drink fluids and this will lead to the need for hospitalization, which, in turn, will increase treatment costs, in addition to increasing morbidity and contributing to worsening QoL [15]. This study aimed at evaluating the oral health-related QoL at different times of oncologic treatment among patients with head and neck cancer. To the best of our knowledge, sequential assessments of the oral health-related QoL in a cancer population represent scarce data to date.

2. Material and Methods

This prospective observational study was conducted at a clinical research center specialized in care for systemically compromised individuals during the period 2013 to 2019. The inclusion criteria for the participation in this research were the following: patients over 18 years of age with indication for the same radiation dose and session numbers of radiotherapy for oral or oropharyngeal cancer. Patients who met all inclusion criteria and could be followed up before, during and at least three months after radiotherapy were incorporated in this study. Informed consent was obtained from all individual participants included in the study. Patients who refused to sign an informed consent were excluded. Collected data included the oral health-related QoL using OHIP-14 as well as the evaluation of OM and pain symptoms. This study was conducted in strict conformity with ethical principles and was approved by the institutional ethical committee for conducting research on human subjects (CAAE 30180714.3.0000.5417).

2.1. Measurement of oral health-related QoL

Oral health-related QoL was assessed through the validated version of the OHIP-14 questionnaire in the official language of the studied population [16]. The questionnaire comprised 14 items and explored seven dimensions of QoL investigating specific aspects of oral health impact: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap. The participants responded to each item according to the frequency of the impact on a five-point Likert scale (ranging from 0 to 4): (0) never, (1) hardly ever, (2) occasionally, (3) fairly often, and (4) very often. Consequently, it was possible to identify the impact on each dimension of QoL separately and the overall impact as well. Within each dimension, coded responses were multiplied by weights to yield a subscale score: $\text{score} < 1.33 = \text{poor dimensional impact}$; $1.33 < \text{score} < 2.68 = \text{average dimensional impact}$; $\text{score} > 2.68 = \text{strong dimensional impact}$. The overall impact was obtained by adding the scores of all seven dimensions and was rated according to the following: $0 < \text{score} < 9 = \text{poor general impact}$; $10 < \text{score} < 18 = \text{average general impact}$; $19 < \text{score} < 28 = \text{strong general impact}$. A higher score indicated worse oral health-related QoL.

The OHIP-14 questionnaire was administered in the form of interviews by the same calibrated professional. The calibration directions were limited to instructing the participants to read the questions and answers aloud, as written, and showing them the response cards. Also, it was applied at four different times.

- T1: the initial consultation before undergoing dental treatment and antineoplastic therapy, with the purpose of evaluating the conditions of the patient's oral cavity.
- T2: after dental treatment prior to radiotherapy. The dental treatment aimed at reducing the risk of oral complications related to oncologic treatment and consisted of removal of infectious foci and carious lesions, change of deficient restorations, scaling and dental extractions previous to radiotherapy.
- T3: during radiotherapy, after 15 to 20 sessions.
- T4: after completion of radiotherapy.

2.2. Assessment of OM and pain symptoms

The assessment of OM was performed using the WHO scale that assesses swallowing capacity as well as the absence/presence of ulcers in the oral cavity [17]. The related pain was estimated using the Visual Analogue Scale (VAS) where, using a ruler with a 0 to 10 mark, the patient was asked about the level of pain, considering 0 as painless and 10 as the worst pain.

The influence of the severity of OM and oral pain on the overall impact was measured at T3.

2.3. Statistical analysis

Statistical analyses were performed by the SigmaPlot software for Windows version 12.5. Friedman non-parametric statistical test with significance level of 5 % combined with Tukey multiple comparison test was used to compare the impact on the seven dimensions as well as the overall impact between T1, T2, T3 and T4. Consequently, it was possible to evaluate the impact of dental treatment and radiotherapy on the patients' QoL.

In order to evaluate the influence of OM severity and oral pain on the overall impact (T3), Spearman's correlation coefficient (ρ) was calculated with significance level of 5 %.

3. Results

The sample consisted of 24 patients (Table 1), who were followed up for this research from 6 to 18 months (10.12 ± 4.24). Nineteen individuals were male and five were female, whose age ranged from 29 to 87 years (57.87 ± 12.49). All seven dimensional impacts and the overall impact were analyzed at four distinct times (Fig. 1).

Functional limitation showed a significant statistical difference when T1 and T3, T1 and T4, T2 and T3, and T2 and T4 were compared. In this dimension, no statistical difference between T1 and T2, and T3 and T4 were detected. At T1, 75 % (N = 18) of patients presented poor dimensional impact score, 25 % (N = 6) evidenced moderate dimensional impact, and no one scored strong dimensional impact. At T2, function limitation exhibited for a clear majority of participants (79,13 %; N = 19) a poor dimensional impact, while 16,67 % (N = 4) presented average dimensional impact and strong dimensional impact comprised only one patient (4.2 %). At T3, poor dimensional impact comprised

Table 1
Characteristics of the study population.

Gender	Female: 5 (20,84 %) Male: 19 (79,16 %)
Age (years)	Minimum: 29 Average: 57,87 % \pm 12.49 Maximum: 87
Base Disease (location)	Tongue base: 11 (45,83 %) Oropharynx: 2 (8,33 %) Larynx: 2 (8,33 %) Nasopharynx: 2 (8,33 %) Tongue mouth floor: 1 (4,16 %)
	Pharyngeal tonsil: 1 (4,16 %) Hypopharynx: 1 (4,16 %) Alveolar ridge: 1 (4,16 %) Lower lip: 1 (4,16 %) Tonsillar fossa: 1 (4,16 %)
Diagnosis	Squamous Cell Carcinoma: 23 (95,83 %) Diffuse B-cell lymphoma: 1 (4,16 %)
Surgery	Yes: 11 (45,83 %) No: 14 (54,16 %)
Radiotherapy (modality/dose)	3d conformal radiotherapy: 24 (100 %) 7000 cGy: 24 (100 %)
Chemotherapy	Cisplatin weekly: 23 (95,83 %) Cisplatin biweekly: 1 (4,16 %)

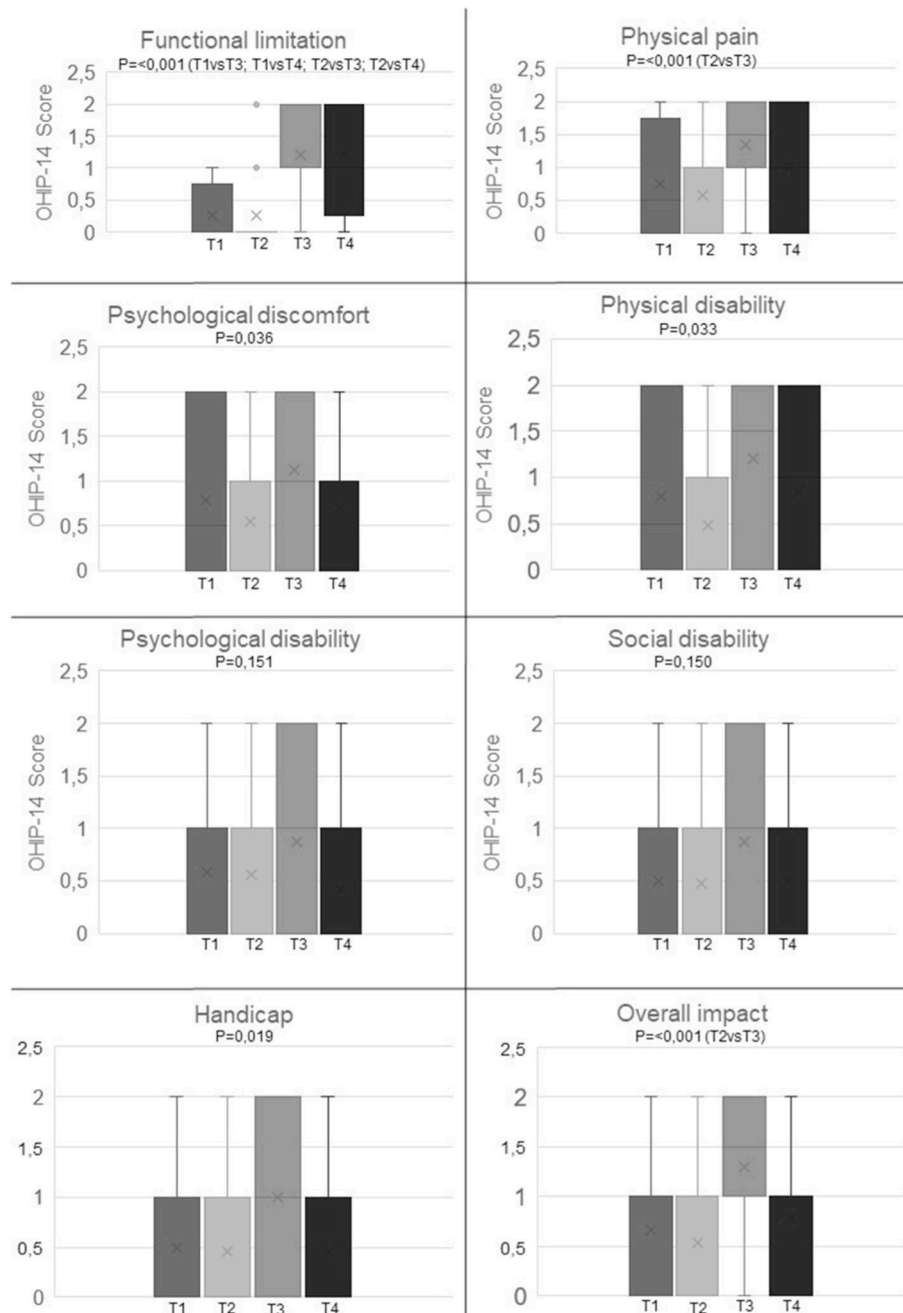


Fig. 1. Impact on 7 dimensions and overall impact of OHIP-14.

12.5 % (N = 3) patients and 54.17 % (N = 13) participants presented average dimensional impact, and 33,33 % (N = 8) patients scored strong dimensional impact. At T4, 25 % (N = 6) participants demonstrated poor dimensional impact followed by 29.16 % (N = 7) participants with average dimensional impact, and most of the strong (45.84 %; N = 11) ones. So, the dental treatment did not impact this dimension. However, the functional limitation had worsened since radiotherapy started.

Physical pain revealed a significant statistical difference only between T2 and T3. At T2, the largest number of individuals (58.33 %; N = 14) had poor dimensional impact; 25 % (N = 6) and 16,67 % (N = 4) had moderate and strong impact, respectively. In this dimension, T3 involved 16.67 % (N = 4) of patients on poor impact score, 33,33 % (N = 8) on moderate impact score, and 50 % (N = 12) on strong impact score. At T4, there were 8 (33.33 %) patients in each impact score (poor/moderate/strong). Hence, physical pain increased during radiotherapy

only, and the dental treatment did not impact physical pain.

In reference to psychological discomfort, physical disability, psychological disability, social disability and handicap, no significant statistical difference was detected. Nonetheless, the overall impact showed a significant statistical difference between T2 and T3. At T2, poor (66.67 %; N = 16) and moderate (33.33 %; N = 8) overall impact embraced all patients. Conversely, most patients accounted for strong (41.66 %; N = 10) and moderate (37.5 %; N = 9) overall impact at T3; poor overall impact decreased to a frequency of 20.84 % (N = 5) at this time. Thus, the radiotherapy strongly affected overall impact, and the dental treatment showed no influence in this impact.

Finally, there was no significant correlation ($\rho = 0.15$ and $P = 0.478$) between the degree of mucositis (WHO graduation) and the overall impact during radiotherapy. Not even the pain showed a significant correlation with the overall quality. However, pain (VAS)

showed a significant positive correlation with the degree of OM ($p = 0.00108$). Pain increases with the severity of OM ($\rho = 0.626$). Consequently, OM negatively impacted patients' QoL.

The results obtained from OHIP-14 according to the dimensions in addition to the overall impact are illustrated in Fig. 1.

4. Discussion

The incidence of oral and oropharyngeal carcinomas has been increasing worldwide [18]. Nonetheless, the global survival for people with these diseases improved dramatically [19]. In this respect, individual perceptions concerning the oral health impact profile have been giving increasing weight, resulting in integration into clinical protocols [2,3,19]. So, Therefore, this is a prospective observational study that evaluated the association between dental treatment prior to antineoplastic therapy (radiotherapy for head and neck cancer), pain and oral mucositis with oral health-related QoL at the following moments: T1: first visit to assess oral conditions, T2: after dental treatment and before the start of radiotherapy, T3: during radiotherapy (between 15 and 20th session) and T4: after the end of radiotherapy.

Our results indicated that radiotherapy and OM considerably worsened oral health-related QoL. In fact, patients treated for oral cancer have a very high prevalence of oral impacts on their daily life. A cross-sectional study with 133 patients using OHIP-14 and Oral Impacts on Daily Performances (OIDP) revealed more than 95 % of participants reporting a negative impact on the oral health-related QoL for both measures [20]. Physical pain, functional limitation, and physical disability were the dimensions with the higher impact, reflecting the most reported impaired functions: eating (83.5 %), speaking (77.4 %) and emotional status (64.7 %). Moreover, 16.6 % of patients experienced one or two impacts, 23.3 % reported three or four, and 55.6 % reported five or more impacts. Similar results were seen in another cross-sectional study where oral cancer patients had worse oral health-related QoL and worse scores in physical dimensions of health-related QoL than the general population [21].

It should be stressed that the radiotherapy impacted on limitation functional ($P < 0.001$) and physical pain ($P < 0.001$) in the present study. It strongly affected overall impact ($P = 0.001$) too. In agreement, high-dose radiotherapy demonstrated worsening of QoL during treatment probably due to its established side effects [19,22]. Other studies showed a decline in general and mental health, physical function, appearance, employment, and social functioning during and immediately after treatment for head and neck cancer [23,24]. Patients with oral squamous cell carcinoma in the anterior floor of the mouth felt that radiotherapy was much worse than surgery [25]. Likewise, patients who received only surgical treatment obtained better scores in the oral health-related QoL (OHIP-14 and OIDP) than those who received combined treatment (surgery and radiotherapy and/or chemotherapy) [25]. Also, many head and neck cancer survivors continue to suffer from various diseases and to receive treatment for physical and psychosocial problems for many years after antineoplastic therapies [22]. Two prospective cohort studies reported that the health-related QoL ten years after cancer diagnosis was significantly lower than the health-related QoL before cancer treatment [23].

OM is an acute, debilitating and very severe side effect of cancer treatment resulting from cumulative doses of radiotherapy. OM causes substantial pain and discomfort, compromising oral hygiene, speech, food and swallowing capacity, resulting in the patient's QoL worsening [26]. This complication can negatively influence the outcomes of cancer treatment and patient survival [13] and, therefore, represents an important aspect to be considered when assessing QoL related to the oral health of the population with cancer. Interestingly, OM and oral pain were not associated ($\rho = 0,15$; $P = 0,478$) with the overall impact during radiotherapy probably because of the small sample size. However, a significant positive correlation between pain and OM could be seen ($\rho = 0.626$; $p = 0.00108$). In other words, the most severe

manifestations of OM were related to the highest VAS values.

Dental treatment that precedes radiotherapy and chemotherapy for head and neck cancers has been a frequent recommendation by specialists [19,27,28]. Several studies have shown a lower incidence and severity of oral complications associated with cancer treatment when patients adhered to dental care and foci of oral infection were eliminated [19,29]. In this research, dental treatment did not have a statistically significant influence on the assessed dimensions and on the overall impact. However, clinically, dental treatment provided improvement in oral conditions, which resulted in a lower risk of developing complications and greater control of adverse effects arising from cancer treatment. No improvement in dimensional and overall impact might be explained by the small sample size. It should be emphasized that the dental treatment caused no damage to patients' QoL. In addition, there is a clear need and demand by patients for oral rehabilitation to restore function a way beyond general well-being [19].

Corroborating this, a prospective evaluation of health-related QoL in oral and oropharyngeal cancer survivors revealed that dental hygienist was the most frequently reported supportive care need during the oncologic treatment and during a long-term follow-up (11 years) as well [30]. A multidisciplinary approach to patient care is critical for the best treatment outcomes and may significantly improve the patient survival [19].

Although this is a prospective study with a long-term follow-up, it has limitations. First, the sample size is small. Therefore, some statistically significant differences could not have been detected. Second, this sample is heterogeneous regarding oncologic treatment. Nine patients underwent surgical resection which might impact on oral health-related QoL, acting as a confounder. In this study, there was no control group as it would be unethical not to undergo dental treatment prior to radiotherapy in the participants, since there are already studies in the literature that prove the benefits provided by this dental treatment.

In conclusion, this prospective study with a long-term follow-up of patients with head and neck cancer provided relevant information concerning the impacts caused by oral problems on health-related QoL along the antineoplastic treatment. This understanding can orientate the progress of preventive approaches and more resolute and extensive treatments focusing not only in solving oral problems, but also pondering their impact on the global health of cancer survivors.

5. Conclusion

This prospective study with a long-term follow-up of patients with head and neck cancer provided relevant information concerning the impacts caused by oral problems on health-related QoL along the antineoplastic treatment. This understanding can orientate the progress of preventive approaches and more resolute and extensive treatments focusing not only in solving oral problems, but also pondering their impact on the global health of cancer survivors.

Ethics

This study was approved by the institutional ethical committee for conducting research on human subjects (CAAE 30180714.3.0000.5417).

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CRediT authorship contribution statement

Raquel D'Aquino Garcia Caminha: Writing – review & editing, Writing – original draft, Validation, Supervision, Project administration, Methodology, Formal analysis, Data curation. **Rogério Jardim Caldas:** Writing – original draft, Validation, Supervision, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Isabela Camera Messias Bueno:** Writing – original draft, Visualization, Validation, Methodology, Investigation, Data curation. **Ana Cláudia Scaraficci:** Writing – original draft, Visualization, Validation, Methodology, Funding acquisition, Data curation. **Paulo Sergio da Silva Santos:** Writing – review & editing, Supervision, Project administration, Methodology, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Ana Claudia Scaraficci reports financial support was provided by State of Sao Paulo Research Foundation under GRANT (number 14/04445-0). If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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