Quality of Life in Swallowing Disorders after Nonsurgical Treatment for Head and Neck Cancer

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Introduction

Radiotherapy or chemoradiotherapy can result in severe swallowing disorders with potential risk for aspiration and can negatively impact the patient’s quality of life (QOL).

Objective To assess swallowing-related QOL in patients who underwent radiotherapy/chemoradiotherapy for head and neck cancer.

Methods We interviewed 110 patients (85 men and 25 women) who had undergone exclusive radiotherapy (25.5%) or concomitant chemoradiotherapy (74.5%) from 6 to 12 months before the study. The Quality of Life in Swallowing Disorders (SWAL-QOL) questionnaire was employed to evaluate dysphagia-related QOL.

Results The QOL was reduced in all domains for all patients. The scores were worse among men. There was a relationship between oral cavity as the primary cancer site and the fatigue domain and also between advanced cancer stage and the impact of food selection, communication, and social function domains. Chemoradiotherapy association, the presence of nasogastric tube and tracheotomy, and the persistence of alcoholism and smoking had also a negative effect on the QOL.

Conclusions According to the SWAL-QOL questionnaire, the dysphagia-related impact on QOL was observed 6 to 12 months after the treatment ended.
reproducible for assessing the perception of dysphagia and has been validated in Brazilian Portuguese.\textsuperscript{11} Recently, the psychometric and clinical validity of the SWAL-QOL questionnaire was tested in patients with oral and oropharyngeal cancer and was found to be reliable, clinically feasible, and useful for evaluating swallowing problems. A difference of 12 points or more in score was considered clinically and statistically relevant in comparing groups of patients.\textsuperscript{12} The aim of this study is to evaluate swallowing-related QOL in patients who underwent radiotherapy or chemoradiotherapy for treatment of head and neck tumors.

**Methods**

This cross-sectional study consisted of 110 previously untreated patients from 21 to 87 years old (median, 61; 77.3% men and 22.7% women) who underwent radiotherapy or concomitant chemoradiotherapy for the treatment of head and neck squamous cell carcinoma. The protocol was approved by the research board, and the patients gave their consent for participation in this study. They were prospectively enrolled in the study from 6 to 12 months after the treatment ended. All patients were evaluated between May and August 2012 at the Service of Radiotherapy of the institution in which treatment was performed. All patients completed the study. Their data are presented in Table 1.

The patients were asked to fill out the SWAL-QOL questionnaire previously validated in Brazilian Portuguese.\textsuperscript{11} It is a 44-item tool for assessing swallowing-related WOL, using 11 domains, including burden, desire, eating duration, symptoms frequency, food selection, communication, fear, mental health, sleep, social, and fatigue. Scores were calculated from each SWAL-QOL domain on a scale from 0 to 100, with a score of 100 representing the most favorable state.

The questionnaires were filled out once in a cross-sectional analysis by the patient alone or with the help of a relative or an interviewer if the patient was illiterate. Epidemiologic and clinicopathologic details were obtained from the charts. Central trend and variability measurements were used to describe the numerical variables and the frequency distributions for categorical variables. To investigate associations between numerical variables (measurements) in groups with two categories, the nonparametric Mann-Whitney \textit{U} test was applied; with three or more categories, the nonparametric Kruskal-Wallis test was used. When statistically significant differences were identified, the significance value was adjusted by means of Bonferroni correction. A significance level of 5% was used for all statistical tests, unless adjusted through Bonferroni correction, in which cases new significance values are presented. The IBM-SPSS statistical computer software (IBM-SPSS Statistics GradPack, Armonk, USA), version 21.0, was used to perform the statistical analysis.

**Results**

The SWAL-QOL questionnaire indicated low median levels, generally with worse scores for desire, mental health, burden, and eating duration domains (Table 2).

The association between sex and the SWAL-QOL questionnaire was verified and the scores showed higher QOL impact among men in almost all domains, including eating duration ($p = 0.003$), mental health ($p = 0.006$), and symptom frequency ($p = 0.022$). Other domains also presented differences of more than 12 points but lacked statistical significance (desire, communication, fear, and sleep; Table 3).

The primary tumor site was significantly correlated between oral cavity tumors and the fatigue domain ($p = 0.041$). There was a difference of more than 12 points in the communication domain for the larynx in comparison with other sites, which was not statistically significant.

Patients with advanced primary tumors (T4) had the worst results for the food selection ($p = 0.037$), communication ($p = 0.022$), and social ($p = 0.021$) domains. There were

| Variable | Category | $n$ (%) |
|----------|----------|---------|
| Age (y)  | Minimum–maximum 25th percentile 50th percentile (median) 75th percentile | 21–87 56.0 62.0 69.0 |
| Sex      | Female  Male | 25 (22.70) 85 (77.30) |
| Tumor site | Oral cavity Oropharynx Nasopharynx Larynx Hypopharynx Unknown primary | 8 (7.30) 33 (30.0) 9 (8.20) 24 (21.80) 10 (9.10) 26 (23.60) |
| T        | T0  T1  T2  T3  T4 | 2 (1.80) 27 (24.50) 24 (21.80) 28 (25.50) 29 (26.40) |
| N        | N0  N1  N2a  N2b  N2c  N3 | 63 (57.30) 9 (8.20) 16 (14.50) 10 (9.10) 7 (6.40) 5 (4.50) |
| Treatment modalities | Exclusively conventional radiotherapy Chemoradiation | 28 (25.50) 82 (74.50) |
| Nasogastric tube | No During radiotherapy During and after radiotherapy In use | 77 (70) 9 (8.20) 16 (14.50) 8 (7.30) |
| Tracheotomy | No Definitive During radiotherapy Under temporary use | 85 (77.30) 8 (7.30) 13 (11.80) 4 (3.60) |
| Keep smoking | No Yes | 66 (60) 44 (40) |
| Keep drinking | No Yes | 80 (72.70) 30 (27.30) |
more than 12-point differences in scores for the burden, desire, eating duration, and mental health domains, suggesting that those patients had a worse QOL. On the other hand, the association between the regional stage (N) and the SWAL-QOL did not present a statistically significant correlation in the questionnaire domains.

A total of 82 of the 110 patients underwent chemotherapy concomitant to the radiotherapy. The result in the burden domain was worse in this group ($p = 0.020$) than in the group of exclusive radiotherapy. The scores presented a difference for the communication ($50 \times 25$) and fatigue ($27.08 \times 50$) domains but lacked statistical significance.

The presence of a nasogastric tube impacted on almost all domains, mainly eating duration ($p < 0.001$), symptom frequency ($p < 0.001$), food selection ($p < 0.001$), mental health ($p < 0.001$), and social ($p < 0.001$; Table 4). Bonferroni correction showed differences in the eating duration, frequency of symptoms, food selection, and mental health domains. Furthermore, the use of nasogastric tube during and after radiotherapy also interfered with some QOL aspects (Table 5).

The questionnaire also identified a statistically significant impact of the definitive tracheotomy in the communication domain ($p < 0.001$; Tables 6 and 7).

Alcohol consumption had a negative influence on QOL in the domains of communication ($p = 0.020$) and mental health ($p = 0.031$). The burden ($25 \times 9.38$), social ($40 \times 33.75$), and fatigue ($52 \times 33.3$) domains were identified via differences in scores as well. On the other hand, patients who continued to smoke presented worse results on the burden ($p = 0.003$), mental health ($p = 0.030$), and fatigue ($p = 0.028$) domains.

### Discussion

The incidence of posttreatment dysphagia in patients with head and neck cancer has previously been reported to be between 50 and 60%. Furthermore, it has been estimated that 30 to 50% of patients with head and neck cancer demonstrate some degree of malnutrition. The combination of dysphagia with poor nutrition, significant weight loss, and impaired immune function often results in cachexia, fatigue, high susceptibility to infection, poor wound healing, or death.

The most common acute side effects of chemoradiotherapy are mucositis, pain, dermatitis, xerostomia, loss of taste, hoarseness, weight loss, myelosuppression, nausea, and dysphagia. The most frequent late side effects are xerostomia, loss of taste, fibrosis, trismus, and dysphagia. Dysphagia has a potential for aspiration and death due to aspiration pneumonia. Thus, it is important to evaluate the short-, medium-, and long-term functional outcomes of radiotherapy treatment associated or not with chemotherapy. Some factors related to pretreatment status, such as weight, staging, primary tumor site, and treatment modality, interfere in the outcome and the QOL.

We found the median scores of SWAL-QOL for the whole group showed some loss in almost all domains, even 6 to 12 months following treatment completion. Some aspects specifically related to feeding, such as desire, eating duration, burden, food selection, and fear, seemed to have relevance for those patients, jeopardizing their mental health. A person with dysphagia spends a longer time eating, presents lower skill to eat varied food, and can be afraid, constrained, and/or incapable of eating in public, remaining socially isolated and depressed.

Men are more prone to be affected than women, showing a greater difficulty to adapt.

Dysphagia is common after the treatment of head and neck cancer; mucositis, nausea, loss of eating desire, taste changing, and xerostomia can make eating difficult and cause fatigue, jeopardizing the QOL. The fatigue domain presented a higher impact among patients with oral cancer. In fact, eating for a longer time can cause a feeling of fatigue. On the other hand, laryngeal cancer showed an impact on communication, due to mucosa dryness, fibrosis, muscular atrophy, and edema, which are consequent to radiotherapy
and can affect vocal production.\textsuperscript{21–23}\ In addition, tumor location itself has some importance. Patients with advanced primary tumor presented worse results. In contrast, the stratification of the patients according to the cervical staging (N) had no relationship with the QOL in our study, but other studies found that bilateral neck irradiation contributes to worse functional outcome.\textsuperscript{18}

Most of our patients (74.5\%) underwent concomitant chemoradiotherapy with greater harm on the burden domain. The effects of late radiation-induced toxicity on deglutition and the salivary glands are more intense in the first 12 months after treatment and decrease gradually after 18 to 24 months.\textsuperscript{24} It should also be mentioned that dysphagia and QOL are damaged in advanced tumors, worsen during chemoradiotherapy, and improve 6 months after the treatment.\textsuperscript{25}

We studied patients whose period after the treatment conclusion varied from 6 to 12 months. When the SWAL-QOL was associated with the type of treatment, the first aspect accentuated was the domain of burden (which is related to dysphagia), followed by the domains of fatigue (related to feeding

\begin{table}[h]
\centering
\begin{tabular}{|l|l|l|l|l|l|l|}
\hline
Variable & Sex & \multicolumn{1}{l|}{\textit{n}} & \multicolumn{1}{l|}{min.–max.} & \multicolumn{1}{l|}{25th percentile} & \multicolumn{1}{l|}{50th percentile} & \multicolumn{1}{l|}{75th percentile} & \multicolumn{1}{l|}{\textit{p}} \\
\hline
Burden & Female & 25 & 0–100 & 50 & 62 & 100 & 0.038\textsuperscript{a} \\
& Male & 85 & 0–100 & 25 & 50 & 93.75 & \\
& Total & 110 & 0–100 & 25 & 50 & 100 & \\
Desire & Female & 25 & 16.60–100 & 29 & 41 & 75 & 0.120 \\
& Male & 85 & 0–100 & 16 & 33 & 66 & \\
& Total & 110 & 0–100 & 16 & 41 & 66 & \\
Eating duration & Female & 25 & 25–100 & 25 & 50 & 100 & 0.003\textsuperscript{a} \\
& Male & 85 & 0–100 & 25 & 50 & 50 & \\
& Total & 110 & 0–100 & 25 & 50 & 75 & \\
Symptom frequency & Female & 25 & 26.70–100 & 53 & 76 & 83 & 0.022\textsuperscript{a} \\
& Male & 85 & 3.50–100 & 39 & 57 & 78 & \\
& Total & 110 & 3.50–100 & 44 & 60 & 82 & \\
Food selection & Female & 25 & 25–100 & 25 & 75 & 100 & 0.287 \\
& Male & 85 & 0–100 & 25 & 75 & 100 & \\
& Total & 110 & 0–100 & 25 & 75 & 100 & \\
Communication & Female & 25 & 0–100 & 50 & 75 & 100 & 0.204 \\
& Male & 85 & 0–100 & 25 & 75 & 100 & \\
& Total & 110 & 0–100 & 25 & 75 & 100 & \\
Fear & Female & 25 & 25–100 & 46 & 81 & 100 & 0.111 \\
& Male & 85 & 6.20–100 & 34 & 75 & 87 & \\
& Total & 110 & 6.20–100 & 37 & 75 & 93 & \\
Mental health & Female & 25 & 10–100 & 55 & 90 & 100 & 0.006\textsuperscript{a} \\
& Male & 85 & 0–100 & 12 & 50 & 100 & \\
& Total & 110 & 0–100 & 20 & 60 & 100 & \\
Social & Female & 25 & 25–100 & 70 & 85 & 100 & 0.034\textsuperscript{a} \\
& Male & 85 & 0–100 & 35 & 70 & 100 & \\
& Total & 110 & 0–100 & 38 & 75 & 100 & \\
Sleep & Female & 25 & 0–100 & 87 & 100 & 100 & 0.051 \\
& Male & 85 & 0–100 & 50 & 100 & 100 & \\
& Total & 110 & 0–100 & 50 & 100 & 100 & \\
Fatigue & Female & 25 & 25–100 & 70 & 83 & 100 & 0.043\textsuperscript{a} \\
& Male & 85 & 0–100 & 33 & 75 & 100 & \\
& Total & 110 & 0–100 & 41 & 75 & 100 & \\
\hline
\end{tabular}
\caption{Association between SWAL-QOL and sex}
\begin{flushleft}
Abbreviations: max., maximum; min., minimum; SWAL-QOL, Quality of Life in Swallowing Disorders questionnaire.
\end{flushleft}
Note: \textit{p} value according to Mann-Whitney test.
\textsuperscript{a}\textit{p} < 0.05.
Table 4  Association between SWAL-QOL and the presence of nasogastric tube

| Variable         | Nasogastric tube | n   | min.–max. | 25th percentile | 50th percentile | 75th percentile | p     |
|------------------|------------------|-----|-----------|-----------------|-----------------|-----------------|-------|
| Burden           | No               | 77  | 0–100     | 25              | 50              | 100             | 0.032^a|
|                  | During RT        | 9   | 0–100     | 0               | 50              | 62              |       |
|                  | During/after RT  | 16  | 12–100    | 25              | 37              | 68              |       |
|                  | In use           | 8   | 0–75      | 0               | 25              | 34              |       |
|                  | Total            | 110 | 0–100     | 25              | 50              | 100             |       |
| Desire           | No               | 77  | 0–100     | 25              | 41              | 75              | 0.093 |
|                  | During RT        | 9   | 0–66      | 8               | 41              | 58              |       |
|                  | During/after RT  | 16  | 0–100     | 16              | 41              | 50              |       |
|                  | In use           | 8   | 0–75      | 2               | 12              | 60              |       |
|                  | Total            | 110 | 0–100     | 16              | 4               | 66              |       |
| Eating duration  | No               | 77  | 0–100     | 25              | 50              | 81              | < 0.001^a|
|                  | During RT        | 9   | 0–50      | 0               | 25              | 37              |       |
|                  | During/after RT  | 16  | 0–100     | 25              | 25              | 25              |       |
|                  | In use           | 8   | 0–50      | 0               | 0               | 18              |       |
|                  | Total            | 110 | 0–100     | 25              | 25              | 75              |       |
| Symptom frequency| No               | 77  | 0–100     | 25              | 66              | 85              | < 0.001^a|
|                  | During RT        | 9   | 25–66     | 25              | 46              | 53              |       |
|                  | During/after RT  | 16  | 26.70–83.90 | 38            | 56              | 69              |       |
|                  | In use           | 8   | 3.50–71.40 | 10             | 22              | 46              |       |
|                  | Total            | 110 | 3.50–100  | 44              | 60              | 82              |       |
| Food selection   | No               | 77  | 0–100     | 25              | 75              | 100             | < 0.001^a|
|                  | During RT        | 9   | 0–100     | 25              | 25              | 75              |       |
|                  | During/after RT  | 16  | 25–100    | 25              | 37              | 75              |       |
|                  | In use           | 8   | 0–50      | 0               | 0               | 43              |       |
|                  | Total            | 110 | 0–100     | 25              | 75              | 100             |       |
| Communication    | No               | 77  | 0–100     | 50              | 75              | 100             | 0.031^a|
|                  | During RT        | 9   | 0–100     | 0               | 50              | 100             |       |
|                  | During/after RT  | 16  | 0–100     | 6               | 62              | 100             |       |
|                  | In use           | 8   | 0–100     | 0               | 18              | 50              |       |
|                  | Total            | 110 | 0–100     | 25              | 75              | 100             |       |
| Fear             | No               | 77  | 12.50–100 | 56              | 81              | 100             | 0.001^a|
|                  | During RT        | 9   | 18.70–93.70 | 25            | 25              | 81              |       |
|                  | During/after RT  | 16  | 25–100    | 32              | 50              | 85              |       |
|                  | In use           | 8   | 6.20–93.70 | 12             | 25              | 65              |       |
|                  | Total            | 110 | 6.20–100  | 37              | 75              | 93              |       |
| Mental health    | No               | 77  | 0–100     | 40              | 80              | 100             | < 0.001^a|
|                  | During RT        | 9   | 0–75      | 5               | 25              | 60              |       |
|                  | During/after RT  | 16  | 0–100     | 16              | 37              | 73              |       |
|                  | In use           | 8   | 0–50      | 0               | 7               | 23              |       |
|                  | Total            | 110 | 0–100     | 20              | 60              | 100             |       |
| Social           | No               | 77  | 0–100     | 57              | 85              | 100             | < 0.001^a|
|                  | During RT        | 9   | 35–75     | 35              | 40              | 72              |       |
|                  | During/after RT  | 16  | 0–100     | 25              | 47              | 82              |       |
deficit) and communication (related to the tumor and treatment sequel).

The use of a nasogastric tube had an important impact on all domains of the questionnaire, worsening the QOL. A nasogastric tube changes the daily routine and needs special care. Furthermore, feeding time is longer than habitual, and as a result there are social isolation and mental health aspects to its use. The weight loss during and in the 3 months after radiotherapy is independently associated with the QOL in patients with head and neck cancer.26 The use of tracheotomy also affects the QOL, according to the questionnaire, mainly with regard to communication, mental health, and social life. These three domains are clearly related to each other in patients with tracheotomy. The communication domain showed a higher impact during temporary use and during the radiotherapy performance, whereas the social function and food selection domains more often identified definitive use. Food selection harm can be a consequence of posttreatment edema, which damages the pharyngeal transit and might require dietary adaptation to minimize the treatment sequela.23

Mental health was jeopardized among patients who continued to consume tobacco and alcohol. Such patients are prone to depression. The maintenance of those habits is responsible for a lower QOL.17,18,27,28

Dysphagia is generally underdiagnosed or is not properly considered. Despite not replacing the clinical and instrumental evaluations, QOL questionnaires can contribute to evaluating specific aspects regarding the patient’s well-being and

| Table 4 (Continued) |
| Variable | Nasogastric tube | n | min.–max. | 25th percentile | 50th percentile | 75th percentile | p |
|-----------|------------------|---|---------|----------------|----------------|----------------|---|
| In use    | 8                | 0–35 | 0     | 12    | 25  | 0.156 | 0.237 | 0.011 | 0.626 | 0.372 | 0.036 |
| Total     | 110              | 0–100 | 38    | 75    | 100 | 0.458 | 0.061 | 0.001 | 0.305 | 0.138 | 0.006 |
| Sleep     | No               | 77  | 0–100  | 68    | 100  | 100  | 0.001 | 0.253 | 0.007 | 0.638 | 0.455 | 0.166 |
| During RT | 9                | 25–100 | 50    | 87    | 100 | 0.006 | 0.228 | 0.002 | 0.373 | 0.070 | 0.006 |
| During/after RT | 16 | 25–100 | 50    | 93    | 100 | 0.006 | 0.228 | 0.002 | 0.373 | 0.070 | 0.006 |
| In use    | 8                | 12.50–100 | 50    | 75    | 100 | 0.001 | 0.228 | 0.002 | 0.373 | 0.070 | 0.006 |
| Total     | 110              | 0–100  | 50    | 100   | 100 | 0.001 | 0.228 | 0.002 | 0.373 | 0.070 | 0.006 |
| Fatigue   | No               | 77  | 0–100  | 62    | 83   | 100  | 0.001 | 0.228 | 0.002 | 0.373 | 0.070 | 0.006 |
| During RT | 9                | 0–100  | 25    | 50    | 66  | 0.006 | 0.228 | 0.002 | 0.373 | 0.070 | 0.006 |
| During/after RT | 16 | 0–100 | 33    | 75    | 100 | 0.006 | 0.228 | 0.002 | 0.373 | 0.070 | 0.006 |
| In use    | 8                | 0–83.30 | 8     | 25    | 62  | 0.006 | 0.228 | 0.002 | 0.373 | 0.070 | 0.006 |
| Total     | 110              | 0–100  | 41    | 75    | 100 | 0.006 | 0.228 | 0.002 | 0.373 | 0.070 | 0.006 |

Abbreviations: max., maximum; min., minimum; RT, radiotherapy; SWAL-QOL, Quality of Life in Swallowing Disorders questionnaire.
Note: p value according to Kruskal-Wallis test.

Table 5 Association between SWAL-QOL and the presence of nasogastric tube

| Variable | Not during radiotherapy | Not during after radiotherapy | Not in use | During radiotherapy or during/after radiotherapy | During radiotherapy or in use | During/after radiotherapy or in use |
|----------|-------------------------|-------------------------------|------------|-----------------------------------------------|-------------------------------|-----------------------------------|
| Burden   | 0.156                   | 0.237                         | 0.011      | 0.626                                         | 0.372                         | 0.036                             |
| Eating duration | 0.015                   | 0.061                         | < 0.001a   | 0.305                                         | 0.138                         | 0.006a                            |
| Symptom frequency | 0.003a                  | 0.030                         | < 0.001a   | 0.084                                         | 0.092                         | 0.009                             |
| Food selection | 0.021                   | 0.046                         | < 0.001a   | 0.373                                         | 0.070                         | 0.006a                            |
| Communication | 0.139                   | 0.253                         | 0.007      | 0.638                                         | 0.455                         | 0.166                             |
| Fear     | 0.013                   | 0.139                         | 0.002      | 0.228                                         | 0.324                         | 0.059                             |
| Mental health | 0.005a                  | 0.020                         | < 0.001a   | 0.392                                         | 0.155                         | 0.016                             |
| Social   | 0.004a                  | 0.009                         | < 0.001a   | 0.886                                         | 0.001a                        | 0.011                             |
| Fatigue  | 0.008a                  | 0.317                         | 0.001a     | 0.144                                         | 0.241                         | 0.024                             |

Abbreviations: max., maximum; min., minimum; RT, radiotherapy; SWAL-QOL, Quality of Life in Swallowing Disorders questionnaire.
Note: p value according to Bonferroni correction (p = 0.008512).
### Table 6 Association between SWAL-QOL and the presence of tracheotomy

| Variable          | Tracheotomy | n     | min.–max. | 25th percentile | 50th percentile | 75th percentile | p     |
|-------------------|-------------|-------|-----------|-----------------|----------------|-----------------|-------|
| Burden            | No          | 85    | 0–100     | 25              | 50             | 100             | 0.042 |
|                   | Definitive  | 8     | 0–100     | 0               | 6              | 43              |       |
|                   | Temporary   | 13    | 12.50–100 | 25              | 37             | 50              |       |
|                   | during RT   |       |           |                 |                |                 |       |
|                   | Temporary   | 4     | 0–87.50   | 6               | 50             | 84              |       |
|                   | use         |       |           |                 |                |                 |       |
|                   | Total       | 110   | 0–100     | 25              | 50             | 100             |       |
| Desire            | No          | 85    | 0–100     | 20              | 41             | 70              | 0.133 |
|                   | Definitive  | 8     | 0–50      | 8               | 16             | 43              |       |
|                   | Temporary   | 13    | 0–100     | 12              | 41             | 75              |       |
|                   | during RT   |       |           |                 |                |                 |       |
|                   | Temporary   | 4     | 0–83.30   | 2               | 24             | 72              |       |
|                   | use         |       |           |                 |                |                 |       |
|                   | Total       | 110   | 0–100     | 16              | 41             | 66              |       |
| Eating duration   | No          | 85    | 0–100     | 25              | 25             | 75              | 0.153 |
|                   | Definitive  | 8     | 0–75      | 6               | 25             | 43              |       |
|                   | Temporary   | 13    | 0–100     | 25              | 25             | 37              |       |
|                   | during RT   |       |           |                 |                |                 |       |
|                   | Temporary   | 4     | 0–100     | 0               | 12             | 81              |       |
|                   | use         |       |           |                 |                |                 |       |
|                   | Total       | 110   | 0–100     | 25              | 25             | 75              |       |
| Symptom frequency | No          | 85    | 7.10–100  | 48              | 60             | 85              | 0.042 |
|                   | Definitive  | 8     | 3.50–91   | 24              | 44             | 63              |       |
|                   | Temporary   | 13    | 26.70–75  | 39              | 50             | 60              |       |
|                   | during RT   |       |           |                 |                |                 |       |
|                   | Temporary   | 4     | 8.90–78.50| 12              | 46             | 75              |       |
|                   | use         |       |           |                 |                |                 |       |
|                   | Total       | 110   | 3.50–100  | 44              | 60             | 82              |       |
| Food selection    | No          | 85    | 0–100     | 25              | 75             | 100             | 0.019 |
|                   | Definitive  | 8     | 0–75      | 25              | 25             | 25              |       |
|                   | Temporary   | 13    | 0–100     | 25              | 50             | 87              |       |
|                   | during RT   |       |           |                 |                |                 |       |
|                   | In temporary| 4     | 0–75      | 12              | 56             | 71              |       |
|                   | use         |       |           |                 |                |                 |       |
|                   | Total       | 110   | 0–100     | 25              | 75             | 100             |       |
| Communication     | No          | 85    | 0–100     | 50              | 100            | 100             | < 0.001|
|                   | Definitive  | 8     | 0–100     | 6               | 50             | 50              |       |
|                   | Temporary   | 13    | 0–100     | 0               | 25             | 62              |       |
|                   | during RT   |       |           |                 |                |                 |       |
|                   | Temporary   | 4     | 0–25      | 0               | 0              | 18              |       |
|                   | use         |       |           |                 |                |                 |       |
|                   | Total       | 110   | 0–100     | 25              | 75             | 100             |       |
| Fear              | No          | 85    | 12.50–100 | 46              | 81             | 100             | 0.022 |
|                   | Definitive  | 8     | 6.20–93.70| 25              | 31             | 57              |       |
|                   | Temporary   | 13    | 25–100    | 28              | 37             | 87              |       |
|                   | during RT   |       |           |                 |                |                 |       |
|                   | Temporary   | 4     | 25–100    | 25              | 46             | 92              |       |
|                   | use         |       |           |                 |                |                 |       |
|                   | Total       | 110   | 6.20–100  | 37              | 75             | 93              |       |
| Mental health     | No          | 85    | 0–100     | 25              | 70             | 100             | 0.054 |
|                   | Definitive  | 8     | 5–100     | 6               | 15             | 25              |       |
|                   | Temporary   | 13    | 10–100    | 20              | 45             | 75              |       |
|                   | during RT   |       |           |                 |                |                 |       |
can point out some characteristics that are not measured by pathophysiological parameters.\textsuperscript{29,30}

**Conclusion**

The effects of radiotherapy and chemoradiotherapy on swallowing function are relevant on dysphagia-related QOL. The harm caused by dysphagia from 6 to 12 months after treatment is recognized by patients with advanced tumors. The type of treatment (concomitant combined radiotherapy and chemotherapy), use of nasogastric tube, tracheotomy, and continuation of tobacco and alcohol habits contribute to decreased QOL. The SWAL-QOL questionnaire is a useful and sensible tool to detect difficulties and perspectives of patients with head and neck cancer.

**Table 6 (Continued)**

| Variable | Tracheotomy | \(n\) | min.–max. | 25th percentile | 50th percentile | 75th percentile | \(p\) |
|----------|-------------|------|----------|-----------------|-----------------|-----------------|------|
| Temporary use | 4 | 0–100 | 0 | 35 | 92 |
| Total | 110 | 0–100 | 20 | 60 | 100 |
| Social | | | | | | | |
| No | 85 | 0–100 | 40 | 75 | 100 | 0.003\textsuperscript{a} |
| Definitive | 8 | 15–75 | 22 | 32 | 53 |
| Temporary during RT | 13 | 0–100 | 15 | 40 | 87 |
| Temporary use | 4 | 0–85 | 17 | 72 | 82 |
| Total | 110 | 0–100 | 38 | 75 | 100 |
| Sleep | | | | | | | |
| No | 85 | 0–100 | 50 | 100 | 100 | 0.207 |
| Definitive | 8 | 50–100 | 50 | 62 | 8 |
| Temporary during RT | 13 | 25–100 | 68 | 100 | 100 |
| Temporary use | 4 | 12.50–100 | 21 | 75 | 100 |
| Total | 110 | 0–100 | 50 | 100 | 100 |
| Fatigue | | | | | | | |
| No | 85 | 0–100 | 58 | 75 | 100 | 0.199 |
| Definitive | 8 | 25–100 | 25 | 37 | 75 |
| Temporary during RT | 13 | 0–100 | 29 | 83 | 100 |
| Temporary use | 4 | 0–100 | 0 | 37 | 93 |
| Total | 110 | 0–100 | 41 | 75 | 100 |

Abbreviations: max., maximum; min., minimum; RT, radiotherapy; SWAL-QOL, Quality of Life in Swallowing Disorders (SWAL-QOL) questionnaire.

Note: \(p\) value according to Kruskal-Wallis test.
\textsuperscript{a} \(p < 0.05\).

**Table 7 Association between SWAL-QOL and the permanence of tracheotomy**

| Variable | Not definitively | Not temporarily during RT | Not in temporary use | Definitively or temporarily during RT | Definitively in temporary use | Temporarily during RT in temporary use |
|----------|-----------------|--------------------------|---------------------|--------------------------------------|-------------------------------|----------------------------------------|
| Burden | 0.115 | 0.116 | 0.0525 | 0.051 | 0.332 | 0.908 |
| Symptom frequency | 0.068 | 0.032 | 0.0212 | 0.514 | 0.865 | 0.821 |
| Food selection | 0.005\textsuperscript{a} | 0.0190 | 0.0012 | 0.091 | 0.727 | 0.773 |
| Communication | 0.019 | 0.002\textsuperscript{a} | 0.002\textsuperscript{a} | 0.628 | 0.059 | 0.110 |
| Fear | 0.009 | 0.068 | 0.346 | 0.239 | 0.481 | 0.818 |
| Social | 0.002\textsuperscript{a} | 0.022 | 0.308 | 0.636 | 0.267 | 0.690 |

Abbreviations: max., maximum; Min., minimum; RT, radiotherapy; SWAL-QOL, Quality of Life in Swallowing Disorders questionnaire.

Note: \(p\) value according to Mann-Whitney test adjusted by Bonferroni correction.
\textsuperscript{a} \(p = 0.008512\).
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