



Türk Fizyoterapi ve Rehabilitasyon Dergisi

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SWALLOWING AND QUALITY OF LIFE OUTCOMES EARLY AFTER RADIATION THERAPY IN HEAD AND NECK CANCER PATIENTS

RESEARCH ARTICLE

ABSTRACT

Purpose: The aim of the study was to determine the changes in swallowing function and quality of life in early period after radiotherapy in head and neck cancer (HNC) patients.

Methods: Forty patients with HNC were included in the study. Swallowing function was evaluated by Modified Barium Swallowing Study. Penetration-Aspiration Scale was used to determine the penetration aspiration severity. European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) and European Organization for the Research and Treatment of Cancer, Quality of Life Assessments in Head and Neck Cancer (EORTC QLQ-H&N35) which are specific to cancer patients with acceptable validity and reliability were used for quality of life assessment. All evaluations were performed three times including before radiotherapy, 1 and 3 months after radiotherapy.

Results: The aspiration severity were gradually increased after radiotherapy ($p<0.001$). There was no difference after radiotherapy in all subscales of EORTC QLQ-C30 ($p>0.0166$). Pain and feeling illness decreased ($p<0.001$), swallowing problems, dry mouth, sticky saliva ($p<0.001$), teeth, mouth-opening problems ($p<0.016$) increased after radiotherapy. There was a moderate, negative correlation between aspiration severity and general health status scale ($p<0.001$). There was a moderate, positive correlation between aspiration severity and symptom scale, swallowing ability, social eating, dry mouth, sticky saliva and coughing ($p<0.05$).

Discussion: It can be concluded that swallowing function and swallowing related quality of life parameters were affected negatively in the early period after radiotherapy despite no change in general quality of life perception. It is important for clinicians to be aware of swallowing disorders and its effects on quality of life in the early period to prevent patients from potential long-term effects of swallowing disorders on general quality of life.

Key words: Head and neck neoplasms, radiotherapy, deglutition, deglutition disorders, quality of life

BAŞ BOYUN KANSERLİ HASTALARDA RADYOTERAPİ SONRASI ERKEN DÖNEMDE YUTMA VE YAŞAM KALİTESİ SONUÇLARI

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Çalışmanın amacı; baş boyun kanserli (BBK) hastalarda radyoterapi sonrası erken dönemde yutma fonksiyonu ve yaşam kalitesindeki değişiklikleri belirlemektir.

Yöntemler: Çalışmaya BBK'lı 40 hasta dahil edildi. Yutma fonksiyonu Modifiye Baryum Yutma Çalışması ile değerlendirildi. Penetrasyon aspirasyon şiddetine karar vermek için Penetrasyon Aspirasyon Skalası kullanıldı. Yaşam kalitesi değerlendirmesi için kanser hastalarına özel, geçerliliği ve güvenilirliği olan European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) ve European Organization for the Research and Treatment of Cancer, Quality of Life assessments in Head and Neck Cancer (EORTC QLQ-H&N35) ölçekleri kullanıldı. Tüm değerlendirmeler radyoterapi öncesi, radyoterapi sonrası bir ve üç ayda olmak üzere üç defa yapıldı.

Sonuçlar: Radyoterapi sonrası aspirasyon şiddeti giderek arttı ($p<0.001$). EORTC QLQ-C30'un tüm alt basamaklarında radyoterapi sonrası fark olmadığı bulundu ($p>0.0166$). Ağrı ve kendini hasta hissetme azaldı ($p<0.001$), yutma problemleri, ağız kuruluğu, tükürük yapışkanlığı ($p<0.001$), diş ve ağız açma problemleri ($p<0.016$) radyoterapi sonrası arttı. Aspirasyon şiddeti ile genel sağlık durumu arasında orta düzeyde, negatif yönde ($p<0.001$) ilişki vardı. Aspirasyon şiddeti ile semptom skalası, yutma yeteneği, sosyal yeme davranışı, ağız kuruluğu, tükürük yapışkanlığı ve öksürme arasında orta düzeyde, pozitif yönde ilişki bulundu ($p<0.05$).

Tartışma: Radyoterapi sonrası erken dönemde genel yaşam kalitesi algısında değişiklik olmamasına rağmen yutma fonksiyonu ve yutma ile ilişkili yaşam kalitesi parametreleri olumsuz etkilendiği sonucuna varıldı. Klinisyenlerin, hastalarını yutma bozukluğunun genel yaşam kalitesi üzerine olan olası uzun dönem etkilerinden korumak için yutma bozukluğu ve onun yaşam kalitesine etkisinin erken dönemde farkında olmaları önemlidir.

Anahtar kelimeler: Baş boyun kanseri, radyoterapi, yutma, yutma bozuklukları, yaşam kalitesi

INTRODUCTION

Head and neck cancer (HNC) patients have problems with eating, speaking and respiratory functions due to the anatomical localization of the affected structures. These problems cause decreased quality of life (QOL), which defines the state of well-being (1). Multimodality treatment of the HNC patients can add further morbidity.

HNC patients can be treated with surgery, radiotherapy (RT), chemoradiotherapy (CRT) or a various combinations of each modality. RT alone, or combined with chemotherapy is frequently used for treatment of HNC. Concomitant CRT is the most popular treatment option for organ preservation protocols. It is because CRT trials as an oncologic treatment have encouraging results, allowing for organ preservation with ensuring survival (2-4). However, preservation of larynx, avoidance from surgery does not necessarily yield better function.

RT in HNC patients causes xerostomia, trismus, fibrosis of swallowing muscles and aspiration. These complications cause swallowing disorders. When combined with chemotherapy, the severity of swallowing disorders further increases and may require prolonged non-oral feeding (5). These problems result in increased nutritional deficiency and decreased QOL (1). Swallowing disorders start and progressively increase during RT, while late swallowing disorders are usually observed months to years later. The severity of late swallowing disorders have been reported to worsen in 20 % even years after CRT and it affects QOL negatively (6,7).

Studies usually focus on the late effects of swallowing disorders on QOL and there is often a lack of pretreatment swallowing status and QOL measurements (8-10). It is important to define the swallowing disorders early because it can be resolved shortly in the early period after treatment but late swallowing disorders are irreversible and often progressive in time. So it becomes more important for the clinician to assess the severity of swallowing disorders in HNC patients in the early period and recognizes its effects on their QOL.

The aim of this study was to determine the changes in swallowing function and QOL from pre-radiotherapy period to the early period after RT (1 and

3 months post treatment) in HNC patients. We hypothesized that swallowing would be getting worse and the QOL parameters would decrease in HNC patients in the early period after RT.

MATERIALS AND METHODS

This study was carried out in Hacettepe University, Department of Physiotherapy and Rehabilitation, Swallowing Disorders Unit. Fourty HNC patients who were referred from the Department of Radiation Oncology at Hacettepe University were included in the study. Patients who had swallowing problems due to other medical reasons and prior RT were not included in the study. All patients signed the consent forms to participate the study. The ethical approval was obtained from Hacettepe University, Non-invasive Clinical Research Ethics Committee (LUT 10/55-24, 06.10.2010).

Demographic characteristics of patients (age, gender, height, weight and diagnosis), nature of the disease (localization and stage of tumor) and treatment procedures (the presence of surgery and CT, duration and field of RT) were noted from their hospital files.

Modified Barium Swallowing Study (MBSS) were performed with three food with different consistencies (liquid-pudding-cookie) to assess the dysphagia severity (11). During MBSS, the patients were sitting in the lateral plane and the fluoroscopy tube was positioned to view the oral cavity, soft palate, pharyngeal wall and upper esophagus. The oral, pharyngeal and cervical esophageal swallowing phases could be assessed simultaneously. In statistical analysis, we used 5 ml volume of liquid, pudding and cookie consistencies to monitor swallowing physiology. Penetration-Aspiration Scale (P-AS) was used to determine the penetration aspiration severity (12,13).

European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) and European Organization for the Research and Treatment of Cancer, Quality of Life assessments in Head and Neck Cancer (EORTC QLQ-H&N35) which are specific to cancer patients with acceptable validity and reliability were used for QOL assessment (14). The EORTC QLQ-C30, which is a global QOL scale, includes general health status, functional and symptom scales. The

QLQ-H&N35 is a module used for assessing the health related quality of life (HR-QOL) for HNC. It contains seven multiple item scales which assess the symptoms of pain, swallowing ability, senses (taste/smell), speech, social eating, social contact and sexuality. And it also includes six single item scales, which examine the presence of symptomatic problems associated with teeth, mouth opening, dry mouth, sticky saliva, coughing and feeling ill. All scales of the EORTC QLQ-C30 and QLQ-H&N35 range from zero to 100. A high score for a functional or global HR-QOL scale shows a relatively high/healthy level of functioning or global quality of life. But a high score for a symptom scale shows the presence of a symptom or problems. Patients under the supervision by a physiotherapist read the questions and choose the appropriate response.

All evaluations were performed before RT, 1 month and 3 months after RT.

Statistical Analysis

Statistical analyses were performed using the SPSS software version 15. The variables were investigated using the visual (histograms, probability plots) and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk's test) to determine whether or not they are normally distributed. Descriptive analyses were presented using medians and interquartile range (IQR) for the non-normally distributed and ordinal variables. Friedman tests were conducted to test whether there is a significant change in PAS scores and QOL parameters. The Wilcoxon test was performed to test the significance of pairwise differences to adjust for multiple comparisons. An overall 5% type-I error level was used to infer statistical significance and Bonferroni correction for multiple comparisons was used to ensure a 0.05 level of significance in QOL measurements due to lots of variables. Spearman correlation coefficients were calculated for the EORTC QLQ-C30, EORTC QLQ-HN35 scores and PAS liquid scores to assess association between life quality and swallowing function. Correlation coefficients between 0.05-0.30 indicate low correlation; where, 0.30-0.40 indicate low to moderate correlation, 0.40-0.60 indicate moderate correlation, 0.60-0.70 indicate good correlation, 0.70-0.75 indicate strong correlation, and 0.75-1.00 indicate excellent correlation.

RESULTS

The study included 40 HNC patients whose median age was 56 years (range between 20-65 years) with swallowing disorders. All cases underwent RT, of whom 33 (82.5) received concomitant CRT. Two (5%) patients underwent surgery for primary tumor, 24 (60%) underwent surgery for primary tumor with neck dissection and 14 (35%) had no surgery. RT was delivered to primary tumor and/or all lymphatics. All cases received RT to primary tumor site. Beside the primary site, 27 patients received additional RT to lymphatics in right side of neck, 26 to left side of neck and 28 to supraclavicular fossa. Median daily dose was 180 cGy (range be-

Table 1. Characteristics of the study population

| Patient characteristics | n | % |
|----------------------------------|----|------|
| Sex | | |
| Male | 33 | 82.5 |
| Female | 7 | 17.5 |
| Disease characteristics | | |
| Tumor location | | |
| Larynx | 20 | 50 |
| Nasopharynx | 5 | 12.5 |
| Tongue | 5 | 12.5 |
| Tonsil | 3 | 7.5 |
| Retromolar trigon | 2 | 5 |
| Parotid | 2 | 5 |
| Lips | 1 | 2.5 |
| Tongue base | 1 | 2.5 |
| Hypopharynx | 1 | 2.5 |
| Tumor stage (TNM) | | |
| I | 5 | 12.5 |
| II | 1 | 2.5 |
| IIA | 2 | 5 |
| IIB | 1 | 2.5 |
| III | 20 | 50 |
| IVA | 11 | 27.5 |
| Treatment characteristics | | |
| Surgery of the primary tumor | | |
| Yes | 26 | 65 |
| No | 14 | 35 |
| Chemotherapy | | |
| Yes | 33 | 82.5 |
| No | 7 | 17.5 |

TNM: Tumor, nodes, metastasis

Table 2. P-AS scores before RT, 1 month and 3 months after RT

| | Before RT | 1 month after RT | 3 months after RT | p |
|--------------|---------------|------------------|-------------------|--------|
| | Med (min-max) | Med (min-max) | Med (min-max) | |
| P-AS liquid | 1 (1-7) | 2 (1-7) | 3 (1-8) | <0.001 |
| P-AS pudding | 1 (1-4) | 1 (1-7) | 2 (1-8) | <0.001 |
| P-AS cookie | 1 (1-4) | 1 (1-7) | 2 (1-8) | <0.001 |

RT: radiotherapy, P-AS: Penetration Aspiration Scale, Med: median, min: minimum, max: maximum

tween 180- 230 cGy). Median RT dose to primary tumor site was 6000 cGy (5580- 7020 cGy), to neck field was 5400 cGy (5000- 6000). And dose was increased up to 7000 cGy if there was gross disease. Population characteristics are summarized in Table 1.

The mean height was 169.48±6.98 cm. The average weight before RT, 1 and 3 months after RT was 76.5±13.2 kg (min:50, max:108), 72.1±13.2 kg (min:47, max:102), 69.8±13.1 kg (min:45, max:100), respectively. Changes in body weight of all participants are shown in Figure 1. The weights of the patients were gradually decreased after RT (p<0.001).

According to MBSS, aspiration severity in liquids and pudding consistencies according to P-AS were

gradually increased after RT (p<0.001). There was no difference between 1 and 3 months after RT (p>0.05), but there is an increase in aspiration severity by the time with cookie consistencies (p<0.001). P-AS scores were shown in Table 2. Aspiration rate for liquid consistency is 5%, 20% and 22.5% before RT, 1 month and 3 months after RT, respectively. Aspiration rate for pudding and cookie consistency is 0, 17.5% and 17.5% before RT, 1 month and 3 months after RT, respectively.

EORTC QLQ-C30 and EORTC QLQ-HN35 scores before, 1 and 3 months after RT were reported in Table 3. Indeed, when a Bonferroni correction of $\alpha = 0.05/3 = 0.016$ had been applied, there was no difference between before and after RT in all

Table 3. PQuality of life parameters before RT, 1 month and 3 months after RT

| | Before RT | 1 month after RT | 3 months after RT | p |
|-----------------------------|---------------|------------------|-------------------|--------|
| EORTC QLQ-C30 | | | | |
| General health status scale | 57.08 (23.54) | 62.67 (23.37) | 62.08 (20.49) | 0.126 |
| Functional scale | 73.28 (17.37) | 71.30 (15.58) | 75.91 (13.79) | 2.23 |
| Symptom scale | 31.92 (23.73) | 29.62 (19.69) | 22.59 (13.63) | 0.035 |
| EORTC QLQ-HN35 | | | | |
| Pain | 30.63 (23.52) | 28.02 (27.31) | 16.77 (17.97) | <0.001 |
| Swallowing ability | 24.58 (25.10) | 43.51 (22.96) | 57.49 (20.57) | <0.001 |
| Social eating | 34.17 (30.42) | 42.71 (27.42) | 32.71 (20.96) | 0.207 |
| Social contact | 25.00 (28.11) | 33.25 (31.65) | 24.25 (24.37) | 0.037 |
| Senses (taste/smell), | 33.33 (27.73) | 42.08 (26.95) | 38.32 (24.21) | 0.115 |
| Speech | 48.05 (32.29) | 51.25 (37.84) | 44.86 (34.81) | 0.171 |
| Sexuality | 27.08 (32.18) | 35.00 (32.42) | 37.08 (27.86) | 0.016 |
| Teeth | 24.99 (34.39) | 44.17 (38.03) | 45.00 (38.16) | 0.007* |
| Mouth-opening | 16.25 (22.48) | 27.49 (32.81) | 30.83 (33.24) | 0.001* |
| Dry mouth (xerostomia) | 23.33 (20.25) | 65.83 (26.68) | 82.50 (21.33) | <0.001 |
| Sticky saliva | 17.49 (21.33) | 69.99 (30.01) | 82.50 (22.63) | <0.001 |
| Coughing | 34.99 (34.55) | 41.67 (38.31) | 44.99 (34.22) | 0.019 |
| Feeling ill | 42.49 (34.58) | 39.17 (27.09) | 23.75 (26.12) | <0.001 |

Values are mean (SD), RT: radiotherapy, * Significant results ($\alpha < 0.016$, according to Bonferroni correction)

Table 4. The correlation between P-AS liquid and EORTC QLQ-C30 and EORTC QLQ-HN35

| EORTC QLQ-C30 | P-AS liquid | |
|-----------------------------|-------------|--------|
| | r | p |
| General health status scale | - 0.584 | <0.001 |
| Functional scale | - 0.214 | 0.19 |
| Symptom scale | 0.373 | 0.01* |
| EORTC QLQ-HN35 | | |
| Fatigue | -0.173 | 0.29 |
| Pain | 0.251 | 0.12 |
| Swallowing ability | 0.460 | 0.01* |
| Social eating | 0.365 | 0.02* |
| Social contact | 0.001 | 0.99 |
| Senses (taste/smell), | 0.010 | 0.95 |
| Speech | 0.043 | 0.79 |
| Sexuality | 0.246 | 0.13 |
| Teeth | 0.069 | 0.67 |
| Mouth-opening | 0.033 | 0.84 |
| Dry mouth (xerostomia) | 0.371 | 0.02* |
| Sticky saliva | 0.373 | 0.02* |
| Coughing | 0.466 | 0.01* |
| Feeling ill | 0.253 | 0.12 |

P-AS: Penetration Aspiration Scale, EORTC QLQ-C30 Version 3.0: European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire, EORTC QLQ-H&N35: European Organization for the Research and Treatment of Cancer, Quality of Life assessments in Head and Neck Cancer,

(Significant results; * <0.05)

subscales of the EORTC QLQ-C30 scale ($p>0.016$). Pain gradually decreased after RT compared to before RT results ($p<0.001$). Swallowing problems gradually increased after RT ($p<0.001$). Teeth and mouth-opening problems increased 3 months after RT compared to before RT results ($p<0.0166$). Dry mouth (xerostomia) and sticky saliva gradually increased after RT ($p<0.001$). Feeling illness decreased 3 months after RT compared to before RT results ($p<0.001$).

We correlated the dysphagia severity and QOL measurements to assess whether dysphagia played a significant role in QOL in the early period after RT. The results of P-AS liquid (3 months after RT) and EORTC QLQ-C30 and EORTC QLQ-HN35 (3 months after RT) were used. Table 4 summarizes that there was a moderate, negative correlation between P-AS liquid and general health status

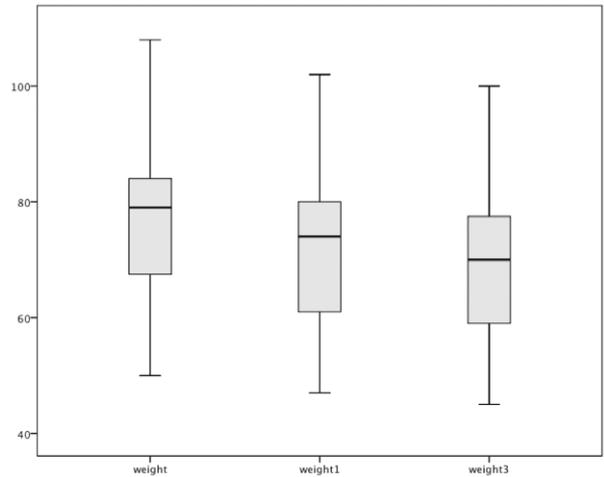


Figure 1. TBox plots for changes in body weight of all participants pretreatment, 1 and 3 months after radiotherapy (weight: before RT, weight1: 1 month after RT, weight3: 3 months after RT)

scale of EORTC QOL-C30 ($p<0.001$), also a moderate, positive correlation between P-AS liquid and symptom scale of EORTC QOL-C30, swallowing ability, social eating, dry mouth, sticky saliva and coughing scales of EORTC QOL-HN35 ($p<0.05$).

DISCUSSION

Swallowing disorders lead to higher risk of aspiration, prolonged non-oral feeding, nutritional deficiency and weight loss. These outcomes cause a social handicap affecting both physical and psychological wellness of the patients and diminishes life quality. One of the common consequences of HNC and its treatment strategies is oropharyngeal dysphagia and it may also result in decreased QOL (15-17). So it is important to determine the swallowing disorders and its effect on QOL earlier in this patient population to make the clinicians more aware of the importance of the early period after RT in HNC patients. It should be noted that if swallowing disorders are defined early, it can be managed easily without adverse effects being observed. Our study is based on this idea, which aimed to show the changes in swallowing function and QOL from pre-radiotherapy period to the early period after RT.

The deterioration in swallowing function after RT in HNC patients was consistent with our swallowing test results. Our study showed that swallowing function of HNC patients started to be seen from the early period after RT. Aspiration was seen only

2 patients (5%) before RT while 9 patients (22.5%) had aspiration in the 3rd month after RT. Aspiration severity in liquids and pudding consistencies also gradually increased after RT. Patterson also found that the aspiration rate was 28% similar to our result. It was commented in Patterson's study that all studies found a significant deterioration in swallowing but there was a disagreement about the trajectory (18). Because the aspiration rates ranged from %36 to %81 in the published studies which was higher than our rate (19-22). The strongest part of our study and Patterson's study about showing the actual aspiration rate may be that patients who reported normal swallowing were not excluded from the study (18). While the aspiration severity was gradually increased by the time, there is also a gradual decrease in weight of the patients. It may be associated with the swallowing results because patients with complaints of dysphagia limited their oral intake unconsciously. There were studies, which showed a relationship between weight changes and eating habits. In a study which described eating and weight changes following CRT for HNC patients concluded that HNC patients lost 10% of their pretreatment weight and another study which also evaluated swallowing function and dietary pattern in HNC patients showed that there was >10% weight loss after RT (23-24).

Contrary to our hypotheses about QOL measurements during early period of RT treatment, there was no change in each subparameters of EORTC QLQ-C30 which were general health status, functional status and symptom scale. In EORTC QLQ-HN35 scale, only parameters associated with swallowing were getting worse. Swallowing problems, teeth and mouth-opening problems, dry mouth (xerostomia) and sticky saliva gradually increased after RT. But feeling illness decreased 3 months after RT in the early period. Our thought about no change in general health perception and decreased feeling ill despite the deterioration of swallowing is that; (1) the acute complications of RT may start to decrease after RT and (2) the termination of the treatment may prevent deterioration in general health perception and feeling ill. Even in a study, which included the QOL evaluation of 187 nasopharyngeal cancer patients, general health status, functional parameters and symptom scores were

better in the short-term follow-up (25). However, studies showed that quality of life worsened in the long term after RT (9). It was reported that oral complications following radiotherapy for head and neck cancer were common and affected QOL. Dry mouth was reported by 91.8%, change in taste by 75.4%, swallowing disorder by 63.1%, altered speech by 50.8%, difficulty in chewing by 43%, tooth decay by 38.5% of dentate patients. Pain was common (58.4%) and interfered with daily activities in 30.8% in patients with head and neck cancer 6 months after RT (26). Only 55.6% of patients were able to return to work 1 year after chemoradiotherapy for head and neck cancer patients in another study (27). Nearly 62% of patients avoided eating with other persons and approximately 37% of patients felt embarrassed at mealtimes (9). So our result about no change in general health perception and decreased feeling ill in the early period after RT did not mean that it will not be worse in the long term because swallowing outcomes and QOL-related swallowing may further worsen and this may affect the general QOL too. It was shown that patients with no/mild dysphagia experienced greater QOL compared with moderate/severe dysphagia (16). When we investigated the correlation between dysphagia severity and QOL measurements to assess whether dysphagia played a significant role in QOL in the early period after RT, there was a correlation between P-AS liquid and symptom scale of EORTC QOL-C30, swallowing ability, social eating, dry mouth, sticky saliva and coughing parameters of EORTC QOL-HN35. These results showed that swallowing disorders started in the early period after RT and began to affect some aspects of QOL in HNC patients negatively. It is important because dysphagia may cause social restriction when the severity of dysphagia is getting worse (6,7).

This study also has some limitations, which were relatively small and mixed sample size and also mixed treatment characteristics. It is obvious that new prospective studies with more sample size, more specific patient profile and treatment characteristics should be initiated. The effect of tumor and treatment characteristics on quality of life after RT in HNC patients can also be investigated.

We concluded that swallowing function of HNC pa-

tients was affected negatively in the early period after RT, however patients' quality of life perception was the same as baseline but the swallowing related QOL parameters were getting worse. These swallowing related QOL parameters also had correlation with swallowing test outcomes. So the early period after RT is important due to swallowing function of HNC patients. We can suggest that clinicians should be aware of swallowing disorders and its effects on QOL despite the general well being in the early period after RT. If the clinicians handle dysphagia symptoms in the early period, the risk of severe dysphagia and reduction in quality of life in the late period can be eliminated. Because dysphagia tends to resolve shortly after treatment but late swallowing disturbances are irreversible and often progressive in time.

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