Effect of an Oral Mucositis Protocol on Quality of Life of Patients With Head and Neck Cancer Treated With Radiation Therapy

Pinar Tekinsoy Kartin, PhD, Sultan Tasci, PhD, Serdar Soyuer, PhD, and Ferhan Elmali, PhD

This study was conducted to determine the effect of an oral mucositis prevention protocol on nutritional status and quality of life for patients undergoing radiation therapy for head and neck cancers. This randomized, controlled, experimental study placed 20 patients in an intervention group where they received an oral care protocol and a nutrition protocol. Thirty patients were placed in the control group. Data were collected through face-to-face interviews using an oral assessment guide, oral evaluation guidelines, an oral toxicity scale, a visual analog scale, a subjective global assessment index, and a quality-of-life scale. As time post-treatment progressed, the prevalence of malnutrition in the intervention group was lower than in the controls group, and the intervention group experienced significantly less pain related to oral mucositis. Similar deteriorations in quality of life were noted in each group.

Head and neck cancers (HNCs) pose a unique difficulty for healthcare providers related to the anatomic, cosmetic, and functional features of their location. Proximity of HNCs to certain anatomic structures can cause substantial functional losses depending on local invasion (Çukurova, Çerci, Arslan, Demirhan, & Özkul, 2007). Radiation therapy (RT) can result in a wide range of complications when used for treatment of HNCs. Oral mucositis from irradiation occurs in 80%–100% of patients (Barasch & Epstein, 2011; Cavusoglu, 2007; Sonis, 2004) and is one of earliest effects of radiation, generally manifesting two weeks after the onset of RT (Çavusoglu, 2007; Yilmaz, 2007). Oral mucositis causes mouth dryness, pain, burning sensations, infections, and ulcerations. Grade 3 and 4 mucositis may limit the ability to eat, drink, swallow, and speak (Shih, Miaskowski, Dodd, Stotts, & MacPhail, 2003; Silverman, 2007).

Oral mucositis impairs food intake for patients, leading to malnutrition. Malnutrition is seen in 40%–80% of patients with cancer and is a major cause of morbidity and mortality (Ertem, 2008; Kömürcü, 2004). Providing nutritional support via protocols is critical during treatment.

Close monitoring and evaluation of mucositis or grade severity progression is very important. However, oral mucosa evaluation is often not practiced sufficiently (Çubukçu & Çinar, 2012; Peterson, 2006; Shieh, Wang, Tsai, & Tseng, 1997; Silverman, 2007; Stonea, Fliednerb, & Smiet, 2005). Randomized and nonrandomized clinical trials aimed at reducing the severity of oral mucositis have reported that cryotherapy (ice chips in the mouth), the use of antiseptic and antifungal agents, applying topical analgesics, and adherence to regular mouth care protocols may be efficient in treating and alleviating oral mucositis (Migliorati et al., 2013; Nicolatou-Galitis et al., 2013; Peterson, Öhrn, & Bowen, 2013; Raber-Durlacher, Von Bültzingslöwen, & Logan, 2013).

Oral hygiene is very important and has been found to diminish oral mucositis in patients who were given regular mouth care (Borowski et al., 1994; McGuire, Correa, Johnson, & Wienandts, 2006). Guidelines from the Multinational Associati-
on of Supportive Care and the International Society for Oral Oncology recommend that patients use a soft toothbrush and apply standardized oral care protocols with oral rinse, including sodium bicarbonate and saline water. Because oral mucositis gives rise to a multitude of problems on a clinical and economic basis, oncology nurses should use evidence-based practices for prevention and treatment. Nurses should be educated on how to evaluate oral mucositis and the use of oral care practices to prevent oral mucositis. In addition, nurses should help educate patients about oral mucositis, the importance of monitoring, and the impact of prevention on quality of life. Therefore, the current study was conducted to determine the effect of protocols to prevent oral mucositis on nutritional status and quality of life in patients receiving RT for HNCs.

Methods

Sample

The study was conducted in an RT oncology unit at a university hospital in Turkey. The study duration was 20 months, with 20 patients randomized to an intervention group and 30 patients randomized to a control group. Participants had nasopharyngeal, laryngeal, gingiva, hypopharyngeal, or tongue and salivary gland HNCs (see Table 1). Inclusion criteria was aged 18 years and older, providing consent to be treated and evaluated with follow-up for seven weeks, having no communication issues (e.g., patients who do not have speech or hearing impairments, patients who are not suffering from mental illness), having an absence of oral mucositis prior to treatment, and having HNC.

### TABLE 1. Sample Characteristics (N = 50)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Intervention Group (n = 20)</th>
<th>Control Group (n = 30)</th>
<th>χ²</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>18</td>
<td>25</td>
<td>0.443</td>
<td>0.41</td>
</tr>
<tr>
<td>Female</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td>0.787</td>
<td>0.553</td>
</tr>
<tr>
<td>39 or younger</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40–49</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50–59</td>
<td>8</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 or older</td>
<td>7</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational status</td>
<td></td>
<td></td>
<td>5.53</td>
<td>0.784</td>
</tr>
<tr>
<td>Illiterate</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literate</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary school</td>
<td>11</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle school</td>
<td>3</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school or higher</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nasopharyngeal</td>
<td>7</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laryngeal</td>
<td>8</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salivary gland</td>
<td>–</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gingiva</td>
<td>–</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypopharyngeal</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tongue</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The university’s ethics committee approved the study, and written informed consent was obtained from the participants. For ethical equality, patients in the control group also were trained about oral health and nutrition after the study ended.

Patients received RT in the outpatient clinic. Six patients whose mucosal grade and ailment symptoms increased were admitted to the hospital for intensive treatment. Because of health deterioration (weakness, fatigue, intensified oral mucositis), one patient in the intervention group (in the seventh week of the study) and six patients in the control group (two patients in the fourth week and four patients in the sixth week) were admitted to the hospital. For those remaining in the study, patients in the intervention group were treated for one week and controls were treated for three weeks in clinic because the general health situation of patients in the intervention group was better than those in the control group. The researchers applied oral care (see Figure 1) and nutritional protocols to intervention group participants. All participants received oral care, including sodium bicarbonate (four times per day), antibiotics, analgesics, and parenteral nutrition support.

Weekly observations were performed for seven weeks by the researchers. Patient identity forms containing sociodemographic characteristics, weight, height, and biochemical findings were recorded. Oral health status, intra-oral pain, nutrition,
Implications for Practice

- Oral care protocols and nutrition protocols can slow the onset of mucositis in patients receiving treatment for head and neck cancers.
- Reduce sores and other impairments to feeding to help improve patients’ quality of life.
- Use validated scales and tools to measure patients’ oral status and quality of life.

and quality of life of patients were quantified. Participants in the intervention group were given oral care and nutrition protocols on the first day of treatment, and the participants and their family members were trained on daily oral care. Patients in the control group did not receive either protocol. Oral health and intra-oral pain state were evaluated from the second to sixth weeks. In the seventh week, first-day observations were repeated. Patients in the control group whose conditions worsened were admitted to the hospital and were given the oral care and nutrition protocols.

Instruments

Data were collected through face-to-face interviews using the Oral Assessment Guide (Eilers, Berger, & Petersen, 1988), an oral toxicity scale from the World Health Organization (Can, 2007), the Visual Analog Scale (VAS) (Price, McGrath, Rafii, & Buckingham, 1983), the Subjective Global Assessment (SGA) index (Detsky et al., 1987), and the European Organisation for the Research and Treatment of Cancer Quality of Life Core 30 Questionnaire (EORTC QLQ-C30).

Eilers et al. (1988) developed the Oral Assessment Guide to show changes in voice, swallowing, lips, tongue, saliva, mucosal membrane, gums, and prosthesis. The Oral Toxicity Scale grades the level of mucositis on a score ranging from 1–4 (with a higher grade indicating less oral mucositis). The VAS is used to assess the intensity of pain. The scale is a 10 cm rule, with one end indicating the absence of pain and the other indicating the most intense pain possible. The SGA index examines medical history and changes in weight, nutritional status, and functional capacity in the past two weeks. Patients scoring 0–1 points on the SGA are considered well nourished, patients scoring 2–8 points are considered to have mild-to-moderate malnutrition, and patients scoring 9 or more points are considered to have severe malnutrition. Finally, the EORTC QLQ-C30 was used to assess quality of life.

Oral Care and Nutrition Protocols

The researchers prepared protocols after examining literature reviews (Atalay Basaran, 2004; Ertem, 2008; Keçeci & Özdemir, 2005; Kelsey, 1997; Kömürçü, 2004; Rubenstein et al., 2004) and based on recommendations of a nutritionist. The protocol is composed of protection and oral care (tooth brushing, features of the toothbrush, and sodium bicarbonate mouth rinse), oral evaluation, and precautions for oral mucositis according to degrees and care (see Figure 2). Nutrition protocol consists of nutritional recommendations for wound, irritation, intensive secretion or xerostomia, smell or taste changes, nausea and vomiting, and nutrition principles after RT (see Appendix A). The protocols were used for preventing oral mucositis and malnutrition. Glutamine powder was given to both groups for nutritional support, a routine practice at the hospital.

Statistical Analysis

Data analysis was conducted with SPSS®, version 15.0, and SigmaStat®, version 3.5. Homogeneity of data was studied using the Shapiro-Wilk test. Independent samples t and Mann Whitney U tests were used for comparing two independent groups with and without normal ranges, respectively. Exact values of the chi-square test for comparing the relationship between subscales were studied using Spearman correlation analysis. A p value of < 0.05 (two-tailed) was set as statistically significant.

Findings

Sociodemographic characteristics of both groups were similar. Fifteen patients in intervention group had nasopharyngeal

Grade 1
- Dentures should be removed to better evaluate the mouth.
- A smooth toothbrush should be used if pain or plaque in the mouth is present.
- Food residuals between teeth should be removed with dental floss.
- Food intake should be continued and a soft diet should be consumed.
- Smoking, eating spicy foods, drinking alcohol, and consuming lemon- or glycerin-containing foods should be avoided.
- The mouth should be rinsed every two hours and after meals; repeat throughout the day if necessary.
- Ice chips may be kept in the mouth to provide a soothing chill.
- Soft paraffin, cold cream, or water-based balm should be used to prevent dryness and cracking of lips.

Grade 2
- Use precautions from grade 1.
- The mouth should be regularly evaluated for seven days.
- Dental floss should not be used if pain and a tendency to bleed is present or if blood levels are low.
- A consultation with a dietitian should be scheduled.
- Fluid intake should be increased (if necessary) and monitored.
- Other infections (e.g., fungal) should be treated.

Grade 3
- Use precautions from grades 1 and 2.
- Rinse the mouth every 1–2 hours with sodium bicarbonate plus saline water.
- Antiviral, antibacterial, or antifungal agents may be given if infection is present.
- Enteral or parenteral nutritional support may be required.
- Painkillers may be used at the discretion of the physician.
- IV fluids may be used.
- Hospital admission may be necessary.

Grade 4
- Use precautions from grades 1–3.
- Patients may have to be admitted to the hospital.
- Life-threatening conditions may occur.

FIGURE 2. Nursing Care for Patients With Oral Mucositis

Note: Based on information from Can, 2007; Cavusoglu, 2007; Cubukcu Elbek et al., 2006; National Cancer Institute, 2014; Yilmaz, 2007.
TABLE 2. Patients Reporting Mucositis Symptoms During Follow-Up (N = 50)

<table>
<thead>
<tr>
<th>Finding</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
<th>Week 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>No mucositis</td>
<td>18</td>
<td>14</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Grade 1</td>
<td>2</td>
<td>14</td>
<td>9</td>
<td>8</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Grade 2</td>
<td></td>
<td></td>
<td>2</td>
<td>15</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Grade 3</td>
<td></td>
<td></td>
<td></td>
<td>16</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>Grade 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

χ²               9.01
p                0.012
C—control; I—intervention

Note. The intervention group contained 20 patients and the control group contained 30 patients.

and laryngeal carcinomas. Ten participants in the intervention group had tumors that were at stage III, seven had nodules at the N₁ level, and one was metastasized. In the control group, 24 had nasopharyngeal and laryngeal cancers, 20 had tumors that were at stage III, nine had nodules at the N₁ level, and seven were metastasized. Disease, diagnosis, and classification of patients in both groups were similar.

In terms of oral mucositis symptoms during weekly observations, development and degree of mucositis symptoms increased in both groups as treatment weeks progressed. Mucositis did not develop during the first week of treatment. Grade 1 oral mucositis developed in the second week in 14 patients in the control group and in two patients in the intervention group (p < 0.05). Grade 4 oral mucositis developed in one patient in the intervention group and in six patients in the control group (p < 0.001) by the seventh week (see Table 2). As treatment weeks progressed, level of perceived intra-oral pain increased in both groups. Three patients in the intervention group and 17 patients in the control groups perceived mild pain in the second week. One patient in the intervention group and 17 in the control group perceived severe and very severe pain in the seventh week (p < 0.05) (see Table 3).

Seven patients in the intervention group were rated as well nourished, nine had malnutrition, and four had severe malnutrition. In the control group, one patient was well nourished, 18 had moderate malnutrition, and 11 were severely malnourished (p < 0.05). Quality-of-life subscale scores are reported in Table 4.

Discussion

Oral mucositis develops in 90%–97% of patients with HNC undergoing RT. Severity of oral mucositis is related to oral hygiene (Çukurova et al., 2007; World Cancer Report, 2008). In the current study, as treatment weeks progressed, mucositis degree progressed more slowly in the intervention group compared to the control group.

In a similar study, Shieh et al. (1997) divided 30 patients on RT into two treatment groups and one control group (10 patients per group). Oral care protocol started one day before treatment in group 1 and one week before treatment in group 2, whereas group 3 received usual care. Mucositis was detected in the second week in four of the patients from group 1, two of the patients from group 2, and six of the patients in group 3. By the fourth week, oral mucositis developed in eight of the patients in group 1, five of the patients in group 2, and in 10 of the patients in group 3 (Shieh et al., 1997). The oral mucositis severity was lower in the two groups receiving oral care protocol compared to the control group.

In a study of 97 patients diagnosed with some type of hemopathy and scheduled to receive treatment with standard chemotherapy or conditioning prior to bone marrow transplantation, Recolons et al. (2006) demonstrated that patients with good oral hygiene presented with oral mucositis in only 27% of cases, compared to 68% in those with normal hygiene (p < 0.013). Additional studies have reported that the application of an oral care protocol reduced mucositis incidence and improved oral mucosa while reducing incidence of oral complications. Applying intensive oral care was superior to restricted oral care (Eilers, 2004; McGuire et al., 2006; Rubenstein et al., 2004).

The current study demonstrates that the oral mucositis rate may be reduced with oral care protocol. Cancer therapy and oral mucositis may cause intra-oral pain. Pain is reported in more than 80% of patients with HNCs, and type and localization

| TABLE 3. Participants’ Pain Level in Study and Control Groups During Follow-Up (N = 50) |
|-----------------------------------------|---------|---------|---------|---------|---------|---------|
| Pain                                    | Week 2  | Week 3  | Week 4  | Week 5  | Week 6  | Week 7  |
|                                        | I       | I       | I       | I       | I       | I       |
| None                                    | 17      | 12      | 6       | 1       | 1       | –       |
| Mild                                     | 3       | 17      | 13      | 12      | 16      | 8       |
| Moderate                                 |        |         |         |         |         |         |
| Severe                                   |        |         |         |         |         |         |
| Very severe                              |        |         |         |         |         |         |

χ²               10.065
p                0.007
C—control; I—intervention

Note. The intervention group contained 20 patients and the control group contained 30 patients.
Oral mucositis may cause impairment of nutritional status. In Kayis (2007), malnutrition was detected after treatment in 65% of those in the intervention group and in 97% of those in the control group (p < 0.05). Studies reviewed by Kara and Akbayrak (2002) regarding patients undergoing RT showed that training and counseling may affect nutritional status and improve anorexia, and cancer cachexia could be decelerated or treated through noninvasive nursing interventions. Ravasco, Monteiro-Grillo, Vidal, and Camilo (2003) emphasized that, rather than providing supplemental support, counseling on nutrition is effective, which corroborates the findings in the current article. Therefore, an oral care protocol and nutritional training provided by nurses may reduce malnutrition.

Oral mucositis from RT causes pain, impairment of nutrition, and deterioration in quality of life (Marin Caro, Laviano, & Pichard, 2007). In the current study, deterioration occurred in physical role, emotional, cognitive, and social functions (subdimensions of quality of life) in both groups after treatment. Peltz (2002) found that, among patients with HNCs undergoing RT, those patients receiving nutritional support scored higher on emotional, physical, and global health status. Controls, however, had higher pain and fatigue scores. Isenring, Bauer, and Capra (2005) reported that nutritional state and quality of life deteriorated after four weeks of treatment in patients with HNCs undergoing RT. Epstein, Robertson, Emerton, Philips, and Moore-Stevenson (2001) found that quality of life of patients on RT deteriorated one month after treatment compared to pretreatment. Nguyen et al. (2005) reported difficulty swallowing and speaking, difficulty taking part in activities, restlessness, a deterioration in eating, and pain symptoms in patients with HNCs. As the weeks of treatment progressed, quality of life deteriorated. Use of evidence-based guides to oral care and nutrition is not at a desired level regarding patient care (Kim et al., 2012). Prospective mucositis symptoms and pain may be eliminated and nutritional state may be improved with oral care and nutritional protocols applied by nurses.

**Limitations**

Limitations of the current study include that the RT had taken in a private hospital when the study started, there was a long follow-up period, a small number of patients with HNCs presented to the radiation-oncology clinic, and occasional breakdowns occurred in RT devices.

**Implications for Nursing Practice and Conclusions**

Nurses working in RT units should explain oral care protocol to patients before treatment and assess a patient’s mouth every week with evidence-based forms. Healthcare professionals should evaluate nutritional status of individuals on RT before, during, and after treatment, and offer education and training. In addition, nurses should use evidence-based protocols, rendering their use in clinics more common. Prior to the study, oral care and nutritional protocols were not used in the authors’ clinic. As a consequence of the findings reported in this article, training tools were published and used. Researchers also provided education to nurses about application of the protocols.

**TABLE 4. Pre- and Post-Treatment Quality of Life Subscale Scores in Study and Control Groups (N = 50)**

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Intervention Group (n = 20)</th>
<th>Control Group (n = 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretreatment</td>
<td>Post-Treatment</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>Range</td>
</tr>
<tr>
<td>Functional score</td>
<td>73.3</td>
<td>73.3–99.4</td>
</tr>
<tr>
<td>Social function score</td>
<td>100</td>
<td>66.6–100</td>
</tr>
<tr>
<td>Symptom score</td>
<td>2.6</td>
<td>0–13.4</td>
</tr>
<tr>
<td>Overall health score</td>
<td>83.3</td>
<td>66.6–100</td>
</tr>
</tbody>
</table>

*Wilcoxon signed ranks test IQR—interquartile range; M—median*
References


by cancer therapy. *Supportive Care in Cancer, 21*, 327–332. doi:10.1007/s00520-012-1562-0


Wounds or Irritation in the Mouth and Throat
- Eat a soft diet (e.g., creamy soup, milk, yogurt, custard, egg, mashed potato, pasta with cheese).
- Eat mashed and soft foods that can easily be swallowed.
- Eat cold or warm foods (chilled fruits and ice blocks in intervals).
- Avoid eating spicy, pepper, bitter tomato or pepper pastes, garlic, hot dips, horseradish, and coconut.
- Rinse mouth with warm saline carbonated water intermittently every 1–2 hours to keep the mouth clean.
- Avoid eating acidic or salted foods, pickled foods, foods containing vinegar and tomato, citrus fruits, fruit juices (lemon, orange), and boxed broth.
- Avoid eating raw vegetables. Eat vegetables after cooking.
- Use basil, oregano, or thyme for dressing foods to increase appetite.

Intense Secretion or Dryness in the Mouth and Throat
- Mucous secretion will decrease if mucous secretion glands are removed with operation or if glands are damaged because of radiation application to glands. Keep the mouth moisturized.
- Inadequate fluid intake results in a reduction of oral secretion. Drink 8–10 glasses of water per day.
- Eat your favorite foods and smell them while chewing.
- Consume foods like meat, poultry, fish, and vegetables by blending to ease swallowing.
- Choose soup prepared with homemade broth or cream and soft foods like yogurt to keep the mouth moisturized.
- Stimulate secretion in the mouth with sugar-free gum or mint tablets.
- Limit consumption of caffeinated foods and beverages.
- Use a cold-air room moisturizer and clean it to avoid bacterial and fungal proliferation.

Changes in Olfaction and Taste Alterations
- Olfactory and taste sensations may alter during cancer treatment; foods may taste bitter or metallic or the taste of food may be reduced.
- Dental issues cause olfactory and taste alterations. Generally, these alterations normalize after the treatment is completed. The following are recommended for these potential problems.
  - Shop for food yourself; choose appealing and nice-smelling foods.
  - If a certain meat smells bad, try others (e.g., poultry, fish, red meat, eggs).
  - Enhance the flavor of meat by marinating with salad dressing or a sauce.
  - Use basil, wild oregano, and rosemary.
  - If dishes smell bad, cook outside or open windows while cooking.
  - Eat dishes when they are warm or at room temperature, not hot.
  - Add cooked onion or garlic to change the taste and smell of dishes.

Nausea and Vomiting
- Eat frequent and small meals slowly.
- Chew the foods fully.
- Drink water or fruit juices one hour before or after the meals, not during eating.
- Avoid eating oily, sugary, and fried foods.
- If vomiting occurs in the morning and there are no wounds in the mouth, eat dried foods like crackers, toast, or bread immediately after waking.
- If certain meat tastes bad, try others (e.g., poultry, fish).
- Keep away from perfume and smoking odors.
- Do not lie supine for the first two hours after the meal.
- Rest quietly after meals.
- Wear loose and comfortable clothes.
- Perform breathing exercises when you have nausea.
- If you have permanent nausea, other entertaining activities may provide distraction (e.g., watching TV, listening to music, knitting, reading books).
- Do not force yourself to eat if you have nausea or if you are vomiting.
- Do not eat anything for 3–4 hours after severe nausea and vomiting.
- It may be relaxing to eat mint or sour candy for reducing unpalatable or metallic drug tastes.

Post-Radiation Therapy
- Eat an adequate and balanced diet. Consume foods from every food group in meals.
- Reduce the amount of fat in your diet. Cook dishes with less oil. Do not eat butter, chips, or fried foods that contain trans fatty acids.
- One third of daily fat consumption should be from sunflower oil and/or corn oil (polyunsaturated fatty acids), one-third from olive oil (monounsaturated fatty acids), and one-third from saturated fatty acids in foods like milk, yogurt, and meat.
- Decrease saturated fatty acid intake by choosing skimmed dairy products and low-fat meat and meat alternates. Use olive oil.
- Consume stewed or baked fish 1–2 times a week. Your diet should include foods such as soy and canola oil, soy bean, flaxseed oil, nuts, and green leafy vegetables.
- Limit salami, sausage, and pastrami-type foods that contain high fat and food preservatives.
- Eat vegetable protein and legumes containing vegetable protein, and eat them with cereals or dairy products to increase the protein quality.
- Consume dairy products that are rich in calcium, phosphorus, B vitamins, and are protective against colon cancer. An adult should have two glasses of skim milk or yogurt per day, on average.
- Kefir, probiotic milk, and yogurt contain beneficial bacteria that boost the immune system, prevent location of pathogen microorganisms, and are anticarcinogenic.
- Eat six or more servings of cereals and vegetables per day. Unrefined grains (e.g., wheat, rye, whole grain flour, bulgur, corn, oat), bread, pasta made from whole grain flour, and whole rice are rich in vitamins, minerals, and dietary fiber.
- Consume fruits and vegetables that are in season. Key anticarcinogenic foods include cauliflower, broccoli, cabbage, celery, artichoke, leek, onion, garlic, radish, spinach, tomato, carrot, citrus fruits, and cress.
- Increase the amount of fruits and vegetables consumed daily. Consume 2–4 servings of raw and cooked vegetables and eat 3–4 servings of fruits.
- Add onion, garlic, parsley, peppermint, and spices (e.g., rosemary, ginger, basil, cumin, fennel) during cooking for flavor and aroma.
- Increase dietary fiber intake by eating legumes, whole grains, whole bread, vegetables, and fruit.
- Reduce daily sugar intake.
- Drink 1.5–2 L of water and fluid. Fluid includes fruit juice, tea, herbal tea (e.g., linden, sage, rosehip, green teas), ayran (yogurt drink), and fruit compotes.

APPENDIX A. Nutrition Protocol for Patients Undergoing Radiation Therapy

Note. Based on information from Atalay Basaran, 2004; Can, 2007; Cavusoglu, 2007; Cubukcu Elbek et al., 2006; Ertem, 2008; Komurcu, 2004; Mahan & Stump, 1996; Yildiz, 2008; Yildiz & Demir, 2004; Yilmaz, 2007.