

**Dietary and nutritional needs of patients after therapy for head and neck cancer**

Joel B. Epstein and Maureen B. Huhmann  
*JADA* 2012;143(6):588-592

---

*The following resources related to this article are available online at [jada.ada.org](http://jada.ada.org) ( this information is current as of October 14, 2013):*

**Updated information and services** including high-resolution figures, can be found in the online version of this article at:  
<http://jada.ada.org/content/143/6/588>

This article cites **36 articles**, 4 of which can be accessed free:  
<http://jada.ada.org/content/143/6/588/#BIBL>

Information about obtaining **reprints** of this article or about permission to reproduce this article in whole or in part can be found at: <http://www.ada.org/990.aspx>

# Dietary and nutritional needs of patients after therapy for head and neck cancer

Joel B. Epstein, DMD, MSD, FRCD(C), Dip ABOM, FDS RCS (Edin);  
Maureen B. Huhmann, DCN, RD, CSO

**Editor's note:** This article is a companion piece to the authors' article "Dietary and Nutritional Needs of Patients Undergoing Therapy for Head and Neck Cancer" (JADA 2011;142[10]:1163-1167).

Cancer survivors represent 3.9 percent of the U.S. population and the percentage is increasing.<sup>1</sup> Maintenance of caloric and nutrient intake is critical for health; however, most patients with head and neck cancer (HNC) experience persistent oral complications that may affect oral intake and nutritional status. These adverse effects include dry mouth (92 percent of patients), change in taste (75 percent) and difficulty in eating (40 percent).<sup>2</sup> Most patients experience pain, and approximately one-third report that orofacial pain has interfered with daily activities.<sup>3</sup> Dry mouth, sticky saliva, speech changes, dental problems and sleep disturbances affect patients' quality of life (QOL).<sup>2</sup>

## SURGICAL EFFECTS

Treatment for HNC results in complications and functional deficits that depend largely on the tumor site and stage, as well as on the treatment provided. Surgical morbidity is related to the surgical site, the amount of tissue removed and the reconstruction performed. Postsurgical pain and dysfunction may persist, affecting the oral aperture and soft-tissue mobility (such as lips, cheek, tongue, soft palate) and causing jaw defects and altered oral sensation. Surgically induced soft-tissue and bony defects, altered oral sensation and surgical grafts that lack sensation and mobility can lead to compromised function that affects oral intake. The ability to wear an oral prosthesis and its function may be

## ABSTRACT

**Background.** The number of cancer survivors in the general population is increasing. Oral and dental status affects patients' quality of life and oral function, which, in turn, may affect nutritional intake and general health. The authors review the importance of oral health and the role of the oral health care provider in supporting dietary intake and providing nutritional guidance.

**Methods.** The authors provide a brief review of oral complications of therapy and nutritional guidelines for patients with head and neck cancer.

**Results.** Oral adverse effects of head and neck cancer treatment include salivary gland dysfunction, taste change, orofacial pain and mucosal sensitivity, oral infection, tissue defects and necrosis, trismus and fibrosis, progressive dental and periodontal disease, and problems with prosthesis function.

**Conclusions.** Managing oral adverse effects of treatment may have an impact on dietary and nutritional intake, as well as on quality of life. Dietary modifications may be needed because of the patient's oral function and may include modification of food texture and flavor, as well as the use of dietary supplements.

**Clinical Implications.** As part of the patient's health care team, dental care professionals should be aware of the oral adverse effects of cancer therapy, as well as their role in recognizing and treating the resulting oral conditions. In addition, they should provide guidance to patients to support their oral dietary and nutritional intake.

**Key Words.** Cancer therapy; head and neck cancer; cancer survivors; oral complications; diet and nutrition.

*JADA*;143(6):588-592.

Dr. Epstein is director, Oral Medicine Services, Division of Otolaryngology and Head and Neck Surgery, City of Hope, 1500 E. Duarte Road, Duarte, Calif. 91010. Address reprint requests to Dr. Epstein.

Dr. Huhmann is manager, Clinical Sciences, Scientific and Regulatory Unit, Nestlé Health Care Nutrition, Parsippany, N.J.

affected. Jaw discontinuity and posttreatment fibrosis may contribute to myofascial pain and temporomandibular dysfunction. Dysphagia and laryngeal and pharyngeal fibrosis, as well as extended periods without oral intake, may lead to weight loss and malnutrition.<sup>4</sup> In addition, patients' frustrations with eating and swallowing impede oral intake.<sup>5</sup>

The National Dysphagia Diet<sup>6</sup> presents dietary modifications that clinicians can tailor to their patients' specific needs. This diet can be used by those who have limitations in oral function due to complications of cancer therapy, as well as dysphagia (Table 1<sup>6</sup>). For patients in whom food intake does not provide sufficient calories and nutrients, liquid supplements are needed.

### SALIVARY FUNCTION

Hyposalivation essentially is universal in patients with HNC. Advances in radiation therapy (for example, intensity-modulated radiation therapy) that enable clinicians to protect salivary glands when possible depending on the tumor's location and extent have increased the number of patients with residual function.<sup>7</sup> Chemotherapy may result in temporary hyposalivation, although this may persist for months. Medications used commonly for supportive care in patients with cancer (such as antiemetics, analgesics, anxiolytics and antidepressants) may affect salivary gland function further. In addition to causing reduced taste as a result of limited exposure of food to taste receptors, dry mouth may increase the risk of developing mucosal infection, which may lead to pain and taste change that then affect oral intake.

Hyposalivation and thick secretions can result from damage to the secretory cells, ducts, salivary gland and blood vessels, as well as from tissue fibrosis.<sup>8</sup> Hyposalivation can affect patients' QOL because of difficulty in chewing and swallowing, leading to embarrassment when eating in public.<sup>7,9-11</sup> In the absence of saliva's antimicrobial properties, infections such as dental caries can progress rapidly. Hyposalivation can be permanent,<sup>7,9,12</sup> and it is associated with poor nutritional status and weight loss in patients with cancer.<sup>13</sup> Patients frequently experience difficulty consuming sufficient calories or nutrients owing to problems associated with lubricating, masticating, tasting and swallowing food. Their dental status and the function of oral

TABLE 1

Dietary modifications for patients with cancer.*	
DIET	TEXTURE MODIFICATIONS
Regular Diet	All foods allowed
Dysphagia Diet, Advanced	Soft-solid foods that require chewing
Dysphagia Diet, Mechanically Altered	Cohesive, moist, semisolid food; limited chewing required
Dysphagia Diet, Puréed	Homogenous, cohesive, pudding-like food

\* Source: National Dysphagia Diet Task Force, American Dietetic Association.<sup>6</sup>

prostheses affect mastication and oral intake.

Although hyposalivation clearly results in dietary changes, the effect on nutrient intake and diet quality is poorly documented, and dietary changes may lead to macronutrient and micronutrient deficiencies that are associated with adverse health outcomes. Tables 1<sup>6</sup> and 2 provide suggested dietary modifications for patients with severe hyposalivation. Sugar-free candy and gum can stimulate residual gland function.<sup>14</sup> Clinicians should treat hyposalivation with sialogogues in patients who have residual gland function. In patients who do not have residual function, mouth-wetting agents may provide palliation.<sup>8,14</sup> Hypnosis and acupuncture have shown some promise in clinical trials for treatment of xerostomia.<sup>15,16</sup>

### ORAL PAIN

Chronic mucosal pain may persist in patients with cancer owing to mucosal damage<sup>17</sup> and neuropathic pain.<sup>18</sup> This pain may occur in patients treated with chemotherapy and targeted chemotherapy, and it is common after radiation therapy. Patients often describe a burning sensation that may worsen when eating acidic or spicy foods. Some patients develop tooth sensitivity that may be due to dentinal sensitivity, enamel demineralization or possibly neuropathy. This sensitivity may affect patients' dietary choices.

### TISSUE NECROSIS

Clinicians may prescribe bisphosphonates and other bone antiresorptive agents in patients with cancer to treat hypercalcemia and bony metastases<sup>19</sup>; however, these medications also increase the risk of developing osteonecrosis of the jaw.<sup>20</sup> Osteonecrosis may arise after trauma, oral surgical procedures and dental disease.<sup>20,21</sup> The clinician may need to modify the texture of the patient's diet if osteonecrosis develops,

**ABBREVIATION KEY.** HNC: Head and neck cancer. QOL: Quality of life.

TABLE 2

**Late complications of head and neck cancer therapy and dietary and nutritional interventions.**

COMPLICATION	DIETARY INTERVENTION
<b>Loss of Appetite</b>	<ul style="list-style-type: none"> <li>• Eat small, frequent meals</li> <li>• Limit beverages to noncarbonated beverages between meals</li> <li>• Drink liquid nutritional supplements</li> </ul>
<b>Taste Changes</b>	<ul style="list-style-type: none"> <li>• Choose tart foods such as oranges or lemonade (if tolerated)</li> <li>• Add flavorful seasonings to foods (for example, garlic, onion, lemon or lime juice, vinegar, bacon bits, basil, oregano and rosemary)</li> <li>• If foods taste metallic, use plastic utensils and dishes</li> <li>• Marinate meats, chicken or fish in fruit juices, sweet and sour sauce, soy sauce, sweet wine or Italian dressing (umami foods/flavors)</li> <li>• Add umami flavors (garlic, soy sauce, Swiss cheese, bacon or onion) to vegetables to enhance their flavor</li> </ul>
<b>Mucositis</b>	<ul style="list-style-type: none"> <li>• Avoid acidic, spicy, rough and salty foods</li> </ul>
<b>Hyposalivation</b>	<ul style="list-style-type: none"> <li>• Choose soft foods that are easy to swallow, such as milkshakes, bananas, applesauce, yogurt, cottage cheese, mashed potatoes, noodles, macaroni and cheese, puddings, scrambled eggs and cooked cereals</li> <li>• Chop/purée or cook vegetables until they are soft</li> <li>• Suck on frozen grapes or melon pieces</li> <li>• Choose fresh fruits high in water such as melons and citrus fruits</li> <li>• Mix food with broth, gravy or sauce to make them easier to swallow</li> <li>• Unless tolerated, limit spicy or salted foods and dry crackers</li> <li>• Drink liquids with meals to moisten food</li> <li>• Avoid alcohol consumption</li> </ul>
<b>Trismus/Dysphagia</b>	<ul style="list-style-type: none"> <li>• Modify food texture (see Table 1<sup>6</sup>)</li> </ul>
<b>Caries Risk</b>	<ul style="list-style-type: none"> <li>• Avoid regular soda, sugar-sweetened candy and gum and concentrated juices</li> <li>• Consume fruits or juices with meals</li> <li>• Pair cariogenic foods with cariostatic/ anticariogenic foods, such as nut butters, cheese and crackers or milk and cereal</li> <li>• Eat sweets and other desserts with meals only</li> <li>• Brush teeth before eating</li> <li>• Chew sugarless gum after eating</li> </ul>

depending on the patient’s ability to open the mouth and chew,<sup>22</sup> as outlined in the National Dysphagia Diet.<sup>6</sup>

The dentist must assess the patient’s dental and periodontal status and any dental prostheses present, as well as determine whether he or she should refer the patient to a dentist experienced in cancer care. Clinicians should counsel dentate patients about approaches to reducing caries risk, including microbial risk (such as oral hygiene, use of chlorhexidine rinse, use of xylitol products), maintaining mineralization (use of fluoride, calcium and phosphates to achieve remineralization) and managing hypo-

salivation, in addition to providing dietary instruction.<sup>23</sup> Patients with tooth loss and altered jaw function may require modifications in food texture. Liquid nutritional supplements may be needed to maintain caloric and protein intake if patients cannot achieve this with diet alone.<sup>6</sup> When oral intake is inadequate to meet caloric and protein needs, other means of feeding, including percutaneous gastric tube feeding, are required.

**TASTE ALTERATIONS**

Hypogeusia (reduced taste acuity) and dysgeusia (distorted taste) can be distressing late effects of cancer therapy. Dysgeusia is associated with direct neurotoxicity to taste buds, hyposalivation and infection.<sup>24,25</sup> Taste is affected in up to 100 percent of patients with HNC during and after radiation

therapy (with or without chemotherapy). Taste change typically begins during the second week of radiation therapy,<sup>26,27</sup> with variable recovery. Investigators in some studies reported improvement after two to six months, whereas others reported indefinite taste changes.<sup>24,25,28</sup> Both standard-dose and high-dose chemotherapy may cause reduced taste or alterations in taste.<sup>29,30</sup> In addition, oral pain and limited mouth opening may hinder oral hygiene, which affects taste. Umami taste frequently is affected, and patients may develop a reduced interest in eating, leading to reduced oral intake and, in turn, caloric and nutrient compromise and

weight loss. Dietary interventions focus primarily on enhancing the flavor of food with more intense flavors (Table 2). Patients should exercise caution with acidic marinades if mouth sores are present.

### TRISMUS

Radiation therapy and surgery may lead to fibrosis in the orofacial region, throat, neck and shoulders. Fibrosis may lead to reduced mouth opening and tongue mobility, as well as limitation of jaw movement.<sup>31,32</sup> Trismus (interincisal opening < 25 mm) occurs in about 45 to 50 percent of patients who undergo radiation therapy to the head and neck.<sup>32,33</sup> Trismus can interfere with oral hygiene, fluoride application, dental care and diet.<sup>22,32</sup> Jaw exercises, particularly if instituted before the onset of trismus, may reduce long-term complications.<sup>34,35</sup> Oral diets may need texture modifications depending on the patient's ability to open his or her mouth and chew.<sup>6,22</sup>

### ORAL INFECTION

Acidogenic oral bacteria, such as *Streptococcus mutans* and lactobacillus, colonize in the setting of hyposalivation and can lead to demineralization and carious lesions<sup>8</sup> within months of the completion of radiation therapy, and they can progress rapidly.<sup>14</sup> Mucosal infection by *Candida* species may alter taste and increase oral sensitivity.<sup>36</sup> Herpes viruses may result in mucosal ulcers and pain that affect oral function and intake.<sup>37</sup>

### RECOMMENDATIONS FOR MAINTAINING NUTRITION

The clinician should address the patient's oral and dental status. If chewing and swallowing become difficult, diet modification is needed (Table 1<sup>6</sup>). Nutritional supplements to maintain caloric and nutrient intake are necessary if oral intake is insufficient, and their provision should be accompanied by an assessment of the patient's weight and hydration. The clinician can accomplish this by obtaining laboratory values for electrolytes and for renal function. If tube feeding or total parenteral nutrition is needed, it should be provided for as short a period as possible, because returning to oral intake may be difficult if tube feeding or total parenteral nutrition is continued for an extended period. A dietitian should provide dietary counseling that focuses on a patient's specific needs regarding attaining and maintaining nutritional well being and on maximizing oral intake.

### CONCLUSION

Oral complications of HNC therapies affect patients' QOL and oral intake. As part of the oncology team, dental care providers play an important role in the prevention and management of oral complications. Maintaining dental health and prosthetic function contribute significantly to oral function. Oral health care professionals should be aware of the critical role of diet and nutrition for cancer survivors, and they should consider an appropriate referral to a dietitian experienced in oncology who can provide individualized dietary counseling to patients. ■

**Disclosure.** Dr. Huhmann is an employee of Nestlé Health Care Nutrition, a manufacturer of nutritional supplements. Dr. Epstein did not report any disclosures.

Nutrition is published in collaboration with the Nutrition Research Scientific Group of the International Association for Dental Research.

- Centers for Disease Control and Prevention. Cancer survivors: United States, 2007. MMWR Morb Mortal Wkly Rep 2011;60(9):270.
- Cooperstein E, Gilbert J, Epstein JB, et al. Vanderbilt Head and Neck Symptom Survey Version 2.0: report of the development and initial testing of a subscale for assessment of oral health (published online ahead of print Aug. 24, 2011). Head Neck doi:10.1002/hed.21816.
- Brown CG, McGuire DB, Peterson DE, Beck SL, Dudley WN, Mooney KH. The experience of a sore mouth and associated symptoms in patients with cancer receiving outpatient chemotherapy. Cancer Nurs 2009;32(4):259-270.
- Murphy BA, Gilbert J. Dysphagia in head and neck cancer patients treated with radiation: assessment, sequelae, and rehabilitation. Semin Radiat Oncol 2009;19(1):35-42.
- Gaziano JE. Evaluation and management of oropharyngeal dysphagia in head and neck cancer. Cancer Control 2002;9(5):400-409.
- National Dysphagia Diet Task Force, American Dietetic Association. National Dysphagia Diet: Standardization for Optimal Care. Chicago: American Dietetic Association; 2002.
- Jensen SB, Pederson AM, Vissink A, et al; Salivary Gland Hypofunction/Xerostomia Section, Oral Care Study Group, Multinational Association of Supportive Care in Cancer (MASCC)/International Society of Oral Oncology (ISOO). A systematic review of salivary gland hypofunction and xerostomia induced by cancer therapies: prevalence, severity and impact on quality of life (published online ahead of print March 17, 2010). Support Care Cancer 2010;18(8):1039-1060. doi:10.1007/s00520-010-0827-8.
- Cooper JS, Fu K, Marks J, Silverman S. Late effects of radiation therapy in the head and neck region. Int J Radiat Oncol Biol Phys 1995;31(5):1141-1164.
- Logemann JA, Pauloski BR, Rademaker AW, et al. Xerostomia: 12-month changes in saliva production and its relationship to perception and performance of swallow function, oral intake, and diet after chemoradiation. Head Neck 2003;25(6):432-437.
- Rodriguez NA, Killion L, Hickey G, et al. A prospective study of salivary gland function in lymphoma patients receiving head and neck irradiation (published online ahead of print March 26, 2009). Int J Radiat Oncol Biol Phys 2009;75(4):1079-1083. doi:10.1016/j.ijrobp.2008.12.053.
- van Rij CM, Oughlane-Heemsbergen WD, Ackerstaff AH, Lamers EA, Balm AJ, Rasch CR. Parotid gland sparing IMRT for head and neck cancer improves xerostomia related quality of life. Radiat Oncol 2008;3:41.
- Mossman K, Shatzman A, Chencharick J. Long-term effects of radiotherapy on taste and salivary function in man. Int J Radiat Oncol Biol Phys 1982;8(6):991-997.
- Oates JE, Clark JR, Read J, et al. Prospective evaluation of quality of life and nutrition before and after treatment for nasopharyngeal carcinoma. Arch Otolaryngol Head Neck Surg 2007;133(6):533-540.
- Garg AK, Malo M. Manifestations and treatment of xerostomia

and associated oral effects secondary to head and neck radiation therapy. *JADA* 1997;128(8):1128-1133.

15. Garcia MK, Chiang JS, Cohen L, et al. Acupuncture for radiation-induced xerostomia in patients with cancer: a pilot study. *Head Neck* 2009;31(10):1360-1368.

16. Schiff E, Mogilner JG, Sella E, et al. Hypnosis for postradiation xerostomia in head and neck cancer patients: a pilot study (published online ahead of print Jan. 31, 2009). *J Pain Symptom Manage* 2009;37(6):1086-1092.e1. doi:10.1016/j.jpainsymman.2008.07.005.

17. Pacholke HD, Amdur RJ, Morris CG, et al. Late xerostomia after intensity-modulated radiation therapy versus conventional radiotherapy. *Am J Clin Oncol* 2005;28(4):351-358.

18. Epstein JB, Hong C, Logan RM, et al. A systematic review of orofacial pain in patients receiving cancer therapy (published online ahead of print June 11, 2010). *Support Care Cancer* 2010;18(8):1023-1031. doi:10.1007/s00520-010-0897-7.

19. Migliorati CA, Schubert MM, Peterson DE, Seneda LM. Bisphosphonate-associated osteonecrosis of mandibular and maxillary bone: an emerging oral complication of supportive cancer therapy. *Cancer* 2005;104(1):83-93.

20. Marx RE. Pamidronate (Aredia) and zoledronate (Zometa) induced avascular necrosis of the jaws: a growing epidemic. *J Oral Maxillofac Surg* 2003;61(9):1115-1117.

21. Migliorati CA, Casiglia J, Epstein J, Jacobsen PL, Siegel MA, Woo SB. Managing the care of patients with bisphosphonate-associated osteonecrosis: an American Academy of Oral Medicine position paper (published correction appears in *JADA* 2006;137[1]:26). *JADA* 2005;136(12):1658-1668.

22. Scott B, Butterworth C, Lowe D, Rogers SN. Factors associated with restricted mouth opening and its relationship to health-related quality of life in patients attending a maxillofacial oncology clinic (published online ahead of print Sept. 7, 2007). *Oral Oncol* 2008;44(5):430-438. doi:10.1016/j.oraloncology.2007.06.015.

23. Rothwell BR. Prevention and treatment of the orofacial complications of radiotherapy. *JADA* 1987;114(3):316-322.

24. Nelson GM. Biology of taste buds and the clinical problem of taste loss. *Anat Rec* 1998;253(3):70-78.

25. Epstein JB, Barasch A. Taste disorders in cancer patients: pathogenesis, and approach to assessment and management (published online ahead of print Dec. 28, 2009). *Oral Oncol* 2010;46(2):77-81. doi:10.1016/j.oraloncology.2009.11.008.

26. Yamashita H, Nakagawa K, Hosoi Y, et al. Umami taste dysfunction in patients receiving radiotherapy for head and neck cancer (published online ahead of print July 11, 2008). *Oral Oncol* 2009;45(3):e19-e23. doi:10.1016/j.oraloncology.2008.04.001.

27. Sandow PL, Hejrat-Yazdi M, Heft MW. Taste loss and recovery following radiation therapy. *J Dent Res* 2006;85(7):608-611.

28. Chasen MR, Bhargava R. A descriptive review of the factors contributing to nutritional compromise in patients with head and neck cancer (published online ahead of print July 18, 2009). *Support Care Cancer* 2009;17(11):1345-1351. doi:10.1007/s00520-009-0684-5.

29. Schubert MM, Correa ME. Oral graft-versus-host disease. *Dent Clin North Am* 2008;52(1):79-109, viii-ix.

30. Peregrin T. Improving taste sensation in patients who have undergone chemotherapy or radiation therapy. *J Am Diet Assoc* 2006;106(10):1536-1540.

31. Dijkstra PU, Kalk WW, Roodenburg JL. Trismus in head and neck oncology: a systematic review. *Oral Oncol* 2004;40(9):879-889.

32. Louise Kent M, Brennan MT, Noll JL, et al. Radiation-induced trismus in head and neck cancer patients (published online ahead of print Oct. 27, 2007). *Support Care Cancer* 2008;16(3):305-309. doi:10.1007/s00520-007-0345-5.

33. Bhatia KS, King AD, Paunipagar BK, et al. MRI findings in patients with severe trismus following radiotherapy for nasopharyngeal carcinoma (published online ahead of print June 6, 2009). *Eur Radiol* 2009;19(11):2586-2593. doi:10.1007/s00330-009-1445-z.

34. Leonard M. Trismus: what is it, what causes it, and how to treat it. *Dent Today* 1999;18(6):74-77.

35. Heller F, Wei FC, Chang YM, et al. A non-tooth-borne mouth-opening device for postoperative rehabilitation after surgical release of trismus. *Plast Reconstr Surg* 2005;116(7):1856-1859.

36. Lalla RV, Latortue MC, Hong CH, et al; Fungal Infections Section, Oral Care Study Group, Multinational Association of Supportive Care in Cancer (MASCC)/International Society of Oral Oncology (ISOO). A systematic review of oral fungal infections in patients receiving cancer therapy (published online ahead of print May 8, 2010). *Support Care Cancer* 2010;18(8):985-992. doi:10.1007/s00520-010-0892-z.

37. Elad S, Zadik Y, Hewson I, et al; Viral Infections Section, Oral Care Study Group, Multinational Association of Supportive Care in Cancer (MASCC)/International Society of Oral Oncology (ISOO). A systematic review of viral infections associated with oral involvement in cancer patients: a spotlight on Herpesviridae (published online ahead of print June 11, 2010). *Support Care Cancer* 2010;18(8):993-1006. doi:10.1007/s00520-010-0900-3.