THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

JADA

Dietary and nutritional needs of patients undergoing therapy for head and neck cancer

Joel B. Epstein and Maureen B. Huhmann

JADA 2011;142(10):1163-1167

Dietary and nutritional needs of patients undergoing therapy for head and neck cancer

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

ABSTRACT

Background. Nutrient and caloric intake is critical during therapy for head and neck cancer.
Methods. The authors review the oral complications experienced by, and dietary and nutritional needs of, patients during therapy. They also present recommendations for oral care and calorie and nutrient intake.
Conclusions. Oral health care professionals can assist patients during treatment for cancer in maintaining oral, systemic and nutritional health, as well as in controlling oral symptoms. Recovery from the acute toxicities of therapy often requires diet modification, tube feeding or both to meet patients' energy and nutrient demands.
Clinical Implications. Effective management of oral complications of therapy for cancer is necessary to facilitate oral intake throughout treatment. Oral health care professionals should be part of the multidisciplinary team helping meet the needs of patients during treatment.

Key Words. Cancer; treatment; diet; nutrition.
JADA 2011;142(10):1163-1167.

Maintaining caloric and nutrient intake is critical during treatment for cancer. In addition to the tumor size and location, anatomical and physiological changes during and after treatments, such as oral mucositis, xerostomia, dysgeusia and dysphagia, are common. Nutritional support during therapy can help blunt unintentional weight loss leading to nutritional compromise, decreased resistance to infection and delayed healing after treatment.[1] The aims of this report are to describe the effect of treatment for head and neck cancer (HNC) and related therapies on oral function and dietary and nutritional status, as well as to suggest strategies for dietary management.

TUMOR AND SURGICAL EFFECTS

The primary malignant disease may exhibit oral and oropharyngeal involvement affecting and limiting oral function, affecting preparation of the food bolus and affecting swallowing. Energy needs of patients with HNC may be increased as a result of tumor nutrient demands[2,3]; byproducts of the tumor can affect metabolism.[4] This variability is caused by individual responses to the tumor; body composition; and tumor type, location and stage.[5]

Postsurgical pain and dysfunction may be acute, chronic or both and may affect function and physiology of the oral cavity and head and neck region. Depending on the site and nature of the tumor and surgery, the oral aperture may be limited, tongue mobility may be compromised and jaw defects may occur as a consequence of tumor extirpation, which can affect sensation and short- and long-term function. Surgical grafts (skin, mucosa or bone) may lack sensation and mobility and lead to compromised sensory and motor function affecting oral intake.

ORAL MUCOSITIS

Oral mucositis is the most common and debilitating toxic effect of chemotherapy and radiation therapy (RT) to the head and neck,[6] and it affects approximately 450,000 patients in the United

At the time this article was written, Dr. Epstein was a professor, Department of Oral Medicine and Diagnostic Sciences, University of Illinois at Chicago. He now is director of oral medicine, City of Hope, 1500 E. Duarte Road, Duarte, Calif. 91010, e-mail "jepstein@coh.org". Address reprint requests to Dr. Epstein. Dr. Huhmann is an adjunct assistant professor of nutrition sciences, Department of Nutrition Sciences, University of Medicine and Dentistry of New Jersey, Newark.

TABLE 1

Dietary modifications for common adverse effects of therapy for cancer.

SYMPTOM	DIETARY MODIFICATIONS
Loss of Appetite	• Eat small, frequent meals • Limit beverages to noncarbonated beverages between meals • Drink liquid nutritional supplements
Taste Changes	• Choose tart foods such as oranges or lemonade (if tolerated) • Add flavorful seasonings to foods such as garlic, onion, lemon or lime juice, vinegar, bacon bits, basil, oregano and rosemary • If foods taste metallic, use plastic utensils and dishes • Try marinating meats, chicken or fish in fruit juices, sweet and sour sauce, soy sauce, sweet wine or Italian dressing (umami foods/flavors) • Add bacon, ham or onion to vegetables to enhance their flavor
Mucositis and Hyposalivation	• Avoid acidic, spicy, rough and salty food • 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 • Chop or cook vegetables until they are soft • Suck on frozen grapes, melon pieces • Choose fresh fruits high in water such as melons, citrus fruits • Mix food with broth, gravy or sauces to make them easier to swallow • Unless tolerated, limit spicy or salted foods and dry crackers • Suck on sugar-free candy and chew gum*
Diarrhea	• Avoid greasy, fatty and fried foods • Avoid high-fiber foods such as fresh fruits with skins and seeds, vegetables, whole-grain breads and cereals, nuts and seeds • Avoid dairy products if lactose intolerance is the cause of diarrhea • Increase beverage intake to replace lost fluid (consider pediatric electrolyte solution, sports beverages low in sugar and broths to replace lost sodium and potassium) • Eat four to six small meals daily instead of two or three large meals • Limit foods and drinks that contain caffeine (such as coffee, tea, soda, chocolate) • Try bananas, white rice, applesauce, diluted apple juice
Constipation	• Increase dietary fiber intake gradually • Add high-fiber foods such as fresh fruits with skins and seeds, fresh vegetables, whole-grain breads and cereals, nuts, seeds and popcorn • Drink at least eight to 10 glasses (8 ounces) of fluid daily, as tolerated • Drink 4 to 8 oz of prune juice once or twice a day or eat five to 10 prunes • Increase physical activity
Nausea and Vomiting	• Eat four to six small meals daily instead of two or three large meals • Include mildly flavored foods such as rice, noodles, toast, crackers, pretzels, ice pops, sherbet, hot cereal and clear broth • Limit fluids to between meals • Avoid foods with strong odors, spices or flavors • Emphasize cold foods, which may be tolerated better because they usually do not have strong odors • Avoid greasy, fatty and fried foods

* Source: Garg and Malo.[16]

States annually. Mucositis affects virtually all patients with HNC receiving RT, approximately 50 percent of patients who have undergone hematopoietic stem cell transplantation (SCT) and up to 25 percent of patients with solid malignancies treated with cycled chemotherapy.[6-11] Patients with solid malignancies who develop mucositis during an earlier cycle of chemotherapy are at an increased risk of developing mucositis in subsequent cycles.

Ulcerative mucositis typically develops by the third or fourth week of RT and persists, with gradual resolution occurring weeks after therapy is completed. Concurrent chemotherapy in these patients increases the severity and duration of mucositis. Ulcerative mucositis induced by chemotherapy typically follows a more acute course, beginning within five to 10 days of drug infusion and resolving in approximately two weeks.[9,12,13]

The Mucositis Study Section of the Multinational Association of Supportive Care in Cancer[14] has developed evidence-based clinical practice guidelines for the prevention and treatment of mucositis; these include good oral hygiene, atraumatic diets, use of palifermin for oral mucositis associated with stem cell transplantation, cryotherapy for mucositis associated

ABBREVIATION KEY. HNC: Head and neck cancer. **5-HT3:** 5-hydroxytryptamine 3. **NK-1:** Neurokinin 1. **RT:** Radiation therapy. **SCT:** Stem cell transplantation.

with high-dose melphalan therapy and other short half-life chemotherapy (for example, bolus 5-fluorouracil) and benzydamine rinse for radiation-induced mucositis (not available in the United States).[9,14] The National Comprehensive Cancer Network Task Force[12] and others[8] have endorsed similar guidelines for the prevention and treatment of mucositis. Analgesic agents, topical coating agents and anesthetics may improve local pain control, thereby facilitating oral intake. Patients who cannot maintain their weight orally may require tube feedings, which, if instituted early, may reduce infections caused by disruption of the gut mucosal barrier.[15]

Hyposalivation. Xerostomia, the symptom of dry mouth, is universal in patients who receive RT to fields that include the salivary glands. Hyposalivation (reduced saliva production) affects one's ability to move food through the mouth and form a food bolus, and it affects swallowing. The degree of hyposalivation can range from a slight decrease in salivary flow to total cessation of saliva production. Advances in RT (for example, intensity-modulated RT) may reduce the number of patients in whom saliva production has stopped, and stimulation of function may be facilitated. Chemotherapy typically results in temporary hyposalivation. In patients who have undergone SCT, chemotherapy, other medications and autoimmune changes (graft versus host disease) may cause salivary dysfunction. In the absence of saliva to dissolve tastants, stimulation of taste receptors may be limited. Secondary mucosal infection may cause pain and changes in taste, which affect oral intake.

Dietary interventions for patients with hyposalivation (Table 1) include sucking on sugar-free candy and chewing gum between meals to assist with palliation.[16] Patients often develop thick, ropy saliva that may aggravate nausea.[17] Frequent rinses with cool sugar-free seltzer or bicarbonate solutions can provide temporary relief. Clinicians can prescribe systemic sialogogues and mucolytic agents to assist in palliation, although the latter are not predictably effective.

Taste. Taste is affected by RT and chemotherapy.[18] In patients receiving RT, taste changes may begin after one week of therapy and progress through treatment; recovery usually occurs three to six months after treatment ends, although changes may be permanent.[9,18] In patients receiving chemotherapy, salivary secretion of systemic drugs may result in acute taste changes (often sour or bitter) that may persist for months. Taste also is affected by salivary function and secondary infection. Oral pain may limit oral hygiene, which, in turn, further affects taste adversely. Umami—or savory taste—frequently is affected and patients may experience a reduced interest in food, leading to weight loss and nutritional compromise. Dietary interventions focus on the more intense flavors, such as smoky bacon or sharp cheese.

Nausea. Nausea may affect patients' interest in oral intake and their ability to maintain it. It is best treated prophylactically because once vomiting has commenced, it is more difficult to control.[19] Currently available medications (Table 2[20-22]) include 5-hydroxytryptamine 3 (5-HT3) antagonists, neurokinin 1 (NK-1) antagonist and steroids, which reduce the incidence and severity of nausea.[20] Clinicians usually treat anticipatory nausea and vomiting with antianxiety medications, specifically benzodiazepines.[20] Because nausea can be induced by smell, opening food trays outside the patient's hospital room may reduce the impact of the smell before eating.

TABLE 2

Antiemetic medications.

TYPE OF NAUSEA AND DRUG CLASS	EXAMPLES OF GENERIC DRUGS	PROPOSED MECHANISM OF ACTION
Anticipatory: Benzodiazepines*	Lorazepam	Antianxiety
Acute: Within 24 Hours of Chemotherapy Administration		
Phenothiazines	Prochlorperazine, promethazine	Depresses the chemoreceptor trigger zone of the medulla*
Dopamine antagonist	Metoclopramide	Accelerates gastric emptying, thereby assisting with emetic control†
Corticosteroids	Dexamethasone	Mechanism not well understood‡
Delayed: Longer Than 24 Hours After Chemotherapy Administration		
5-hydroxytryptamine 3 (5-HT3) antagonists	Ondansetron, granisetron	Inhibits binding of serotonin to afferent vagal nerve fibers†
Neurokinin 1 (NK-1) receptor antagonists	Aprepitant	Prevents the binding of NK-1 in both central nervous system and peripherally*

* Source: Cefalo and colleagues.[20]
† Source: Billio and colleagues.[21]
‡ Source: Jakobsen and Herrstedt.[22]

TABLE 3

Adult oral nutritional supplements.

TYPE OF SUPPLEMENT	DESCRIPTION	EXAMPLES OF BRANDS
Ready-to-Drink Liquid Nutritional	Premixed liquid supplement	**Complete:** Ensure,* Boost†; **Clear Liquid:** Enlive,* Resource Breeze,† Isopure Plus‡
Milk-Based Liquid Nutritional	Powdered supplement to which milk is added	Carnation Instant Breakfast,† Carnation Instant Breakfast (no sugar added),† Scandishake§
Disease-Specific Liquid Nutritional	Premixed liquid supplements with disease-specific alterations in ingredients	**Diabetic:** Glucerna,* Boost Glucose Control†; **Renal:** Nepro,* Suplena,* Renalcal†
Modular	Powders or liquids added to food to increase protein or calorie content	**Liquid:** Benecalorie,† Promod,* Pro-Stat 101¶; **Powder:** Beneprotein,* Unjury Protein#

* Manufactured by Abbott Nutrition, Columbus, Ohio.
† Manufactured by Nestlé HealthCare Nutrition, Florham Park, N.J.
‡ Manufactured by The Isopure Company, Hauppauge, N.Y.
§ Manufactured by Axcan Pharma (now Aptalis), Birmingham, Ala.
¶ Manufactured by Medical Nutrition USA, Englewood, N.J.
# Manufactured by ProSynthesis Laboratories, Reston, Va.

TABLE 4

Routes of and indications for enteral feeding.

FEEDING ROUTE	INDICATIONS
Gastric*	
Nasogastric tube	Short-term feeding access; can be abrasive to nares and mucous membranes
Percutaneous endoscopic gastrostomy tube	Endoscopically placed tube; least invasive permanent feeding tube
Gastrostomy tube	Surgically placed tube; often placed during surgery or if endoscopic placement is not possible (obstructing esophageal tumor)
Small Bowel†	
Percutaneous endoscopic jejunostomy tube	Endoscopically placed tube; may be used if esophageal or gastric surgery is planned
Jejunostomy tube	Surgically placed tube; often placed during surgery or if endoscopic placement is not possible

* Allows the most versatility regarding feeding type (that is, bolus, continuous, gravity), rate and schedule.
† Limits patients to continuous feedings only.

DIETARY MODIFICATIONS FOR COMMON ADVERSE EFFECTS OF TREATMENT

Oral diets are the preferred route of feeding; however, when patients cannot meet their energy and nutrient needs orally, tube feedings are recommended to supplement or replace oral feeding until patients can resume an oral diet.[1,8,9,14] The National Dysphagia Diet presents dietary modifications that clinicians can tailor to their patients' specific needs.[23] The semisolid/solid food segment of the diet includes four levels: dysphagia pureed ("homogenous, very cohesive, pudding-like …"), dysphagia mechanically altered ("cohesive, moist, semisolid foods …"); dysphagia advanced ("soft-solid foods that require more chewing ability") and regular ("all foods allowed").[23]

Texture modifications may be indicated because of edentulism and a patient's altered ability to bite, chew and swallow.[24] Oral health care professionals should counsel patients who have caries or are at risk of developing caries regarding diet and oral hygiene measures to reduce caries risk. Patients should limit consumption of beverages with sugars or acids, sugar-sweetened candy and gum, juices, dried fruits and snacks rich in simple carbohydrates.[14] Table 1 presents recommendations for oral dietary modifications in patients with mucositis, hyposalivation, taste change and other gastrointestinal toxicities. In addition, if a patient cannot tolerate solid foods, oral liquid nutritional supplements, tube feeding or both may be needed (Tables 3 and 4).

CONCLUSIONS

Oral health and function affect patients during therapy for cancer and affect oral intake of food and medications, surgical outcomes, quality of life, complication rates and tolerance of therapy.[25] Clinicians should direct dietary interventions toward improving patients' desire and ability to eat and drink so they can meet their energy and nutrient needs and prevent malnutrition.[25] Dietary modifications, often with liquid nutritional supplements, may be needed if the patient's eating ability is compromised as a result of mucosal damage (Table 3). When oral intake is insufficient to meet energy or nutrient needs, tube feedings may be needed to prevent weight loss and to maintain hydration and nutritional status. As shown in Table 4, the decision regarding route and type of feeding is based on the location of the tube and the patient's tolerance.

Oral health care professionals can assist patients during treatment for cancer in maintaining oral, systemic and nutritional health and in controlling oral symptoms. Clinicians' awareness of approaches to diet modification, as well as consultation with, and referral of patients to, a registered dietitian for diet and nutritional management can assist patients during therapy. ■

Disclosure. Drs. Epstein and Huhmann did not report any disclosures.

1. Capra S, Ferguson M, Ried K. Cancer: impact of nutrition intervention outcome—nutrition issues for patients. Nutrition 2001;17(9):769-772.
2. Tisdale MJ. Pathogenesis of cancer cachexia. J Support Oncol 2003;1(3):159-168.
3. Barber MD. The pathophysiology and treatment of cancer cachexia. Nutr Clin Pract 2002;17(4):203-209.
4. Tisdale MJ. Tumor-host interactions. J Cell Biochem 2004;93(5):871-877.
5. Martin C. Calorie, protein, fluid and micronutrient requirements. In: McCallum PD, Polisena CG, eds. The Clinical Guide to Oncology Nutrition. Chicago: American Dietetic Association; 2000:45-52.
6. Vera-Llonch M, Oster G, Hagiwara M, Sonis S. Oral mucositis in patients undergoing radiation treatment for head and neck carcinoma. Cancer 2006;106(2):329-336.
7. Bellm LA, Epstein JB, Rose-Ped A, Martin P, Fuchs HJ. Patient reports of complications of bone marrow transplantation. Support Care Cancer 2000;8(1):33-39.
8. Peterson DE, Bensadoun RJ, Roila F; ESMO Guidelines Working Group. Management of oral and gastrointestinal mucositis: ESMO Clinical Practice Guidelines. Ann Oncol 2010;21(suppl 5):v261-v265.
9. National Cancer Institute at the National Institutes of Health. Oral complications of chemotherapy and head/neck radiation (PDQ). Oral mucositis. "www.cancer.gov/cancertopics/pdq/supportivecare/oralcomplications/HealthProfessional/page5". Accessed Aug. 29, 2011.
10. Grunberg SH, Hesketh P, Randolph-Jackson P, et al. Risk and quality of life impact of mucosal injury among colorectal cancer patients receiving FOLFOX chemotherapy. In: Proceedings from the 20th Anniversary International MASCC/ISOO Symposium; June 27-30, 2007; St. Gallen, Switzerland. Hillerød, Denmark: MASCC; 2007.
11. Sonis ST, Elting LS, Keefe D, et al; Mucositis Study Section of the Multinational Association for Supportive Care in Cancer; International Society for Oral Oncology. Perspectives on cancer therapy-induced mucosal injury: pathogenesis, measurement, epidemiology, and consequences for patients. Cancer 2004;100(9 suppl):1995-2025.
12. Bensinger W, Schubert M, Ang KK, et al. NCCN Task Force Report. Prevention and management of mucositis in cancer care. J Natl Compr Canc Netw 2008;6 suppl 1:S1-S21. "www.nccn.org/JNCCN/PDF/mucositis_2008.pdf". Accessed Aug. 30, 2011.
13. Jacobsohn DA, Margolis J, Doherty J, Anders V, Vogelsang GB. Weight loss and malnutrition in patients with chronic graft-versus-host disease. Bone Marrow Transplant 2002;29(3):231-236.
14. Keefe DM, Schubert MM, Elting LS, et al; Mucositis Study Section of the Multinational Association of Supportive Care in Cancer and the International Society for Oral Oncology. Updated clinical practice guidelines for the prevention and treatment of mucositis. Cancer 2007;109(5):820-831.
15. Lipkin AC, Lenssen P, Dickson BJ. Nutrition issues in hematopoietic stem cell transplantation: state of the art. Nutr Clin Pract 2005;20(4):423-439.
16. 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.
17. Rodrigues NA, Killion L, Hickey G, et al. A prospective study of salivary gland function in lymphoma patients receiving head and neck irradiation. Int J Radiat Oncol Biol Phys 2009;75(4):1079-1083.
18. Epstein JB, Barasch A. Taste disorders in cancer patients: pathogenesis, and approach to assessment and management. Oral Oncol 2010;46(2):77-81.
19. Einhorn LH, Grunberg SM, Rapoport B, Rittenberg C, Feyer P. Antiemetic therapy for multiple-day chemotherapy and additional topics consisting of rescue antiemetics and high-dose chemotherapy with stem cell transplant: review and consensus statement. Support Care Cancer 2010;19 suppl 1:S1-S4.
20. Cefalo MG, Ruggiero A, Maurizi P, Attina G, Arlotta A, Riccardi R. Pharmacological management of chemotherapy-induced nausea and vomiting in children with cancer. J Chemother 2009;21(6):605-610.
21. Billio A, Morello E, Clarke MJ. Serotonin receptor antagonists for highly emetogenic chemotherapy in adults. Cochrane Database Syst Rev 2010(1):CD006272.
22. Jakobsen JN, Herrstedt J. Prevention of chemotherapy-induced nausea and vomiting in elderly cancer patients. Crit Rev Oncol Hematol 2009;71(3):214-221.
23. American Dietetic Association, National Dysphagia Diet Task Force. National Dysphagia Diet: Standardization for Optimal Care. Chicago: American Dietetic Association; 2002.
24. 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. Oral Oncol 2008;44(5):430-438.
25. August D, Huhmann M. Nutritional care of cancer patients. In: Norton JA, Barie PS, Bollinger RR, et al, eds. Surgery: Basic Science and Clincal Evidence. 2nd ed. New York City: Springer-Verlag; 2008:2123-2150.