

DENTAL TEAM

Oral Complications of Cancer Treatment: What the Dental Team Can Do

With over 1.4 million new cases of cancer diagnosed each year and a shift to outpatient management, you will likely see some of these patients in your practice. Because cancer treatment can affect the oral tissues, you need to know about potential oral side effects. Preexisting or untreated oral disease can also complicate cancer treatment. Your role in patient management can extend benefits beyond the oral cavity.

Oral complications from radiation to the head and neck or chemotherapy for any malignancy can compromise patients' health and quality of life, and affect their ability to complete planned cancer treatment. For some patients, the complications can be so debilitating that they may tolerate only lower doses of therapy, postpone scheduled treatments, or discontinue treatment entirely. Oral complications can also lead to serious systemic infections. Medically necessary oral care before, during, and after cancer treatment can prevent or reduce the incidence and severity of oral complications, enhancing both patient survival and quality of life.

Oral Complications Related to Cancer Treatment

Oral complications of cancer treatment arise in various forms and degrees of severity, depending on the individual and the cancer treatment. Chemotherapy often impairs the function of bone marrow, suppressing the formation of white blood cells, red blood cells, and platelets (myelosuppression). Some cancer treatments are described as stomatotoxic because they have toxic effects on the oral tissues. Following are lists of

side effects common to both chemotherapy and radiation therapy, and complications specific to each type of treatment. You will need to consider the possibility of these complications each time you evaluate a patient with cancer.

Oral complications common to both chemotherapy and radiation

- **Oral mucositis:** inflammation and ulceration of the mucous membranes; can increase the risk for pain, oral and systemic infection, and nutritional compromise.
- **Infection:** viral, bacterial, and fungal; results from myelosuppression, xerostomia, and/or damage to the mucosa from chemotherapy or radiotherapy.
- **Xerostomia/salivary gland dysfunction:** dryness of the mouth due to thickened, reduced, or absent salivary flow; increases the risk of infection and compromises speaking, chewing, and swallowing. Medications other than chemotherapy can also cause salivary gland dysfunction. Persistent dry mouth increases the risk for dental caries.
- **Functional disabilities:** impaired ability to eat, taste, swallow, and speak because of mucositis, dry mouth, trismus, and infection.
- **Taste alterations:** changes in taste perception of foods, ranging from unpleasant to tasteless.
- **Nutritional compromise:** poor nutrition from eating difficulties caused by mucositis, dry mouth, dysphagia, and loss of taste.

- **Abnormal dental development:** altered tooth development, craniofacial growth, or skeletal development in children secondary to radiotherapy and/or high doses of chemotherapy before age 9.

Other complications of chemotherapy

- **Neurotoxicity:** persistent, deep aching and burning pain that mimics a toothache, but for which no dental or mucosal source can be found. This complication is a side effect of certain classes of drugs, such as the vinca alkaloids.
- **Bleeding:** oral bleeding from the decreased platelets and clotting factors associated with the effects of therapy on bone marrow.

Other complications of radiation therapy

- **Radiation caries:** lifelong risk of rampant dental decay that may begin within 3 months of completing radiation treatment if changes in either the quality or quantity of saliva persist.
- **Trismus/tissue fibrosis:** loss of elasticity of masticatory muscles that restricts normal ability to open the mouth.
- **Osteonecrosis:** blood vessel compromise and necrosis of bone exposed to high-dose radiation therapy; results in decreased ability to heal if traumatized.

Who Has Oral Complications?

Oral complications occur in virtually all patients receiving radiation for head and neck malignancies, in approximately 80 percent of hematopoietic (blood-forming) stem cell transplant recipients, and in nearly 40 percent of patients receiving chemotherapy. Risk for oral complications can be classified as low or high:

- **Lower risk:** Patients receiving minimally myelosuppressive or nonmyelosuppressive chemotherapy.
- **Higher risk:** Patients receiving stomatotoxic chemotherapy resulting in prolonged myelosuppression, including patients undergoing hematopoietic stem cell transplantation; and patients undergoing head and neck radiation for oral, pharyngeal, and laryngeal cancer.

Some complications occur only during treatment; others, such as xerostomia, may persist for years. Unfortunately, patients with cancer do not always receive oral care until serious complications develop.

The Role of Pretreatment Oral Care

A thorough oral evaluation by a knowledgeable dentist before cancer treatment begins is important to the success of the regimen. Pretreatment oral care achieves the following:

- Reduces the risk and severity of oral complications.
- Allows for prompt identification and treatment of existing infections or other problems.
- Improves the likelihood that the patient will successfully complete planned cancer treatment.
- Prevents, eliminates, or reduces oral pain.
- Minimizes oral infections that could lead to potentially serious systemic infections.
- Prevents or minimizes complications that compromise nutrition.
- Prevents or reduces later incidence of bone necrosis.
- Preserves or improves oral health.

- Provides an opportunity for patient education about oral hygiene during cancer therapy.
- Improves the quality of life.
- Decreases the cost of care.

With a pretreatment oral evaluation, the dental team can identify and treat problems such as infection, fractured teeth or restorations, or periodontal disease that could contribute to oral complications when cancer therapy begins. The evaluation also establishes baseline data for comparing the patient's status in subsequent examinations.

Before the exam, you will need to obtain the patient's cancer diagnosis and treatment plan, medical history, and dental history. **Open communication with the patient's oncologist is essential to ensure that each provider has the information necessary to deliver the best possible care.**

Evaluation

Ideally, a comprehensive oral evaluation should take place 1 month before cancer treatment starts to allow adequate time for recovery from any required invasive dental procedures. The pretreatment evaluation includes a thorough examination of hard and soft tissues, as well as appropriate radiographs to detect possible sources of infection and pathology. Also take the following steps before cancer treatment begins:

- Identify and treat existing infections, carious and other compromised teeth, and tissue injury or trauma.
- Stabilize or eliminate potential sites of infection.
- Extract teeth in the radiation field that are nonrestorable or may pose a future problem to prevent later extraction-induced osteonecrosis.

- Conduct a prosthodontic evaluation if indicated. If a removable prosthesis is worn, make sure that it is clean and well adapted to the tissue. Instruct the patient not to wear the prosthesis during treatment, if possible; or at the least, not to wear it at night.
- Perform oral prophylaxis if indicated.
- Time oral surgery to allow at least 2 weeks for healing before radiation therapy begins. For patients receiving radiation treatment, this is the best time to consider surgical procedures. Oral surgery should be performed at least 7 to 10 days before the patient receives myelosuppressive chemotherapy. Medical consultation is indicated before invasive procedures.

Supplemental Fluoride

Fluoride rinses are not adequate to prevent tooth demineralization. Instead, a high-potency fluoride gel, delivered via custom gel-applicator trays, is recommended. Several days before radiation therapy begins, patients should start a daily 10-minute application of a 1.1% neutral pH sodium fluoride gel or a 0.4% stannous fluoride (unflavored) gel. Patients with porcelain crowns or resin or glass ionomer restorations should use a neutral pH fluoride. Be sure that the trays cover all tooth structures without irritating the gingival or mucosal tissues.

For patients reluctant to use a tray, a high-potency fluoride gel should be brushed on the teeth following daily brushing and flossing. Either 1.1% neutral pH sodium or 0.4% stannous fluoride gel is recommended, based on the patient's type of dental restorations.

Patients with radiation-induced salivary gland dysfunction must continue lifelong daily fluoride applications.

- Remove orthodontic bands and brackets if highly stomatotoxic chemotherapy is planned or if the appliances will be in the radiation field.
- Consider extracting highly mobile primary teeth in children, and teeth that are expected to exfoliate during treatment.
- Prescribe an individualized oral hygiene regimen to minimize oral complications. Patients undergoing head and neck radiation therapy should be instructed on the use of supplemental fluoride.

Education

Patient education is an integral part of the pretreatment evaluation and should include a discussion of potential oral complications.

Instructions for Patients Using Supplemental Fluoride

If using a tray

- Place a thin ribbon of fluoride gel in each tray.
- Place the trays on the teeth and leave in place for 10 minutes. If gel oozes out of the tray, you are using too much.
- After 10 minutes, remove the trays and spit out any excess gel. Do not rinse.
- Rinse the applicator trays with water.
- Do not eat or drink for 30 minutes.

If using a brush-on method

- After brushing with toothpaste, rinse as usual.
- Place a thin ribbon of gel on the toothbrush.
- Brush for 2 to 3 minutes.
- Spit out any excess gel. Do not rinse.
- Do not eat or drink for 30 minutes.

It is very important that the dental team impress on the patient that optimal oral hygiene during treatment, adequate nutrition, and avoiding tobacco and alcohol can prevent or minimize oral complications. To ensure that the patient fully understands what is required, provide detailed instructions on specific oral care practices, such as how and when to brush and floss, how to recognize signs of complications, and other instructions appropriate for the individual. Patients should understand that good oral care during cancer treatment contributes to its success.

Advise patients to

- Brush teeth, gums, and tongue gently with an extra-soft toothbrush and fluoride toothpaste after every meal and before bed. If brushing hurts, soften the bristles in warm water.
- Floss teeth gently every day. If gums are sore or bleeding, avoid those areas but keep flossing other teeth.
- Follow instructions for using fluoride gel.
- Avoid mouthwashes containing alcohol.
- Rinse the mouth with a baking soda and salt solution, followed by a plain water rinse several times a day. (Use $\frac{1}{4}$ teaspoon each of baking soda and salt in 1 quart of warm water.) Omit salt during mucositis.
- Exercise the jaw muscles three times a day to prevent and treat jaw stiffness from radiation. Open and close the mouth as far as possible without causing pain; repeat 20 times.
- Avoid candy, gum, and soda unless they are sugar-free.
- Avoid spicy or acidic foods, toothpicks, tobacco products, and alcohol.
- Keep the appointment schedule recommended by the dentist.

Oral Care During Cancer Treatment

Careful monitoring of oral health is especially important during cancer therapy to prevent, detect, and treat complications as soon as possible. **When treatment is necessary, consult the oncologist before any dental procedure, including dental prophylaxis.**

- Examine the soft tissues for inflammation or infection and evaluate for plaque levels and dental caries.
- Review oral hygiene and oral care protocols; prescribe antimicrobial therapy as indicated.
- Provide recommendations for treating dry mouth and other complications:
 - Sip water frequently.
 - Suck ice chips or sugar-free candy.
 - Chew sugar-free gum.
 - Use a saliva substitute spray or gel or a prescribed saliva stimulant if appropriate.
 - Avoid glycerin swabs.
- Take precautions to protect against trauma.
- Provide topical anesthetics or analgesics for oral pain.

Other factors to remember

Schedule dental work carefully. If oral surgery is required, allow at least 7 to 10 days of healing before the patient receives myelosuppressive chemotherapy. Elective oral surgery should not be performed for the duration of radiation treatment.

Determine hematologic status. If the patient is receiving chemotherapy, have the oncology team conduct blood work 24 hours before dental treatment to determine whether the patient's platelet count, clotting

Normal Complete Blood Count

Red cells	Male: 4.7–6.1 million cells/mcL Female: 4.2–5.4 million cells/mcL
Hemoglobin	Male: 13.8–17.2 gm/dL Female: 12.1–15.1 gm/dL
Hematocrit	Males: 40.7–50.3% Female: 36.1–44.3%
Platelets	150,000–400,000/mm ³
White blood cells	4,500–10,000 cells/mcL

Differential White Blood Cell (WBC) Count

Neutrophils (PMNs)	40–60%	(3000–6000/mm ³)
Neutrophils (Bands)	0–3%	(0–300/mm ³)
Eosinophils	1–4%	(50–400/mm ³)
Basophils	0.5–1%	(15–50/mm ³)
Lymphocytes	20–40%	(1200–3000/mm ³)
Monocytes	2–8%	(100–600/mm ³)

Absolute Neutrophil Count = WBC × (% PMNs + %Bands)

Source: A.D.A.M. Medical Encyclopedia [Internet]. Atlanta (GA): A.D.A.M., Inc.; ©2005. CBC; [updated 2008 Aug 10; cited 2009 July 31]; WBC; [updated 2009 Feb 21; cited 2009 July 31]; [about 4 p.]. Available from: <http://www.nlm.nih.gov/medlineplus/ency/article/003642.htm>; <http://www.nlm.nih.gov/medlineplus/ency/article/003643.htm>.

factors, and absolute neutrophil count are sufficient to recommend oral treatment. Postpone oral surgery or other oral invasive procedures if:

- platelet count is less than 75,000/mm³ or abnormal clotting factors are present.
- absolute neutrophil count is less than 1,000/mm³ (or consider prophylactic antibiotics).

Consider oral causes of fever. Fever of unknown origin may be related to an oral infection. Remember that oral signs of infection or other complications may be altered by immunosuppression related to chemotherapy.

Evaluate need for antibiotic prophylaxis. If the patient has a central venous catheter, consult the oncologist to determine if antibiotics are needed before any dental treatment to prevent endocarditis (www.americanheart.org).

Follow-up Oral Care

Chemotherapy

Once all complications of chemotherapy have resolved, patients may be able to resume their normal dental care schedule. However, if immune function continues to be compromised, determine the patient's hematologic status before initiating any dental treatment or surgery. This is particularly important to remember for patients who have undergone stem cell transplantation. Ask if the patient has received intravenous bisphosphonate therapy.

Radiation therapy

Once the patient has completed head and neck radiation therapy and acute oral complications have abated, evaluate the patient regularly (every 4 to 8 weeks, for example) for the first 6 months. Thereafter, you can determine a schedule based on the patient's needs. However, keep in mind that oral complications can continue or emerge long after radiation therapy has ended.

Points to remember

- High-dose radiation treatment carries a lifelong risk of xerostomia, dental caries, and osteonecrosis.
- Because of the risk of osteonecrosis, principally in the mandible, patients should avoid invasive surgical procedures, including extractions that involve irradiated bone. If an invasive procedure is required, use of antibiotics and hyperbaric oxygen

therapy before and after surgery should be considered.

- Lifelong daily fluoride application, good nutrition, and conscientious oral hygiene are especially important for patients with salivary gland dysfunction.
- Dentures may need to be reconstructed if treatment altered oral tissues. Some people can never wear dentures again because of friable tissues and xerostomia.
- Dentists should closely monitor children who have received radiation to craniofacial and dental structures for abnormal growth and development.
- Dentists should be mindful about the recurrence of malignancies in patients with oral and head and neck cancers, and thoroughly examine all oral mucosal tissues at recall appointments.

Special Considerations for Hematopoietic Stem Cell Transplant Patients

The intensive conditioning regimens of transplantation can result in pronounced immunosuppression, greatly increasing a patient's risk of mucositis, ulceration, hemorrhage, infection, and xerostomia. The complications begin to resolve when hematologic status improves. Although the complete blood count and differential may be normal, immunosuppression may last for up to a year after the transplant, along with the risk of infections. Also, the oral cavity and salivary glands are commonly involved in graft-versus-host disease in allograft recipients. This can result in mucosal inflammation, ulceration, and xerostomia, so continued monitoring is necessary. Careful attention to oral care in the immediate and long-term post-transplant period is important to patients' overall health.

Additional Readings

Jellema AP, Slotman BJ, Doornaert P, et al.: Impact of radiation-induced xerostomia on quality of life after primary radiotherapy among patients with head and neck cancer. *Int J Radiat Oncol Biol Phys* 2007; 69(3):751-60.

Keefe DM, Schubert MM, Elting LS, et al. Updated clinical practice guidelines for the prevention and treatment of mucositis. *Cancer* 2007 Mar 1; 109(5):820-31. Online at <http://www.mascc.org/mc/page.do?sitePagelD=87007> (Accessed July 2009)

National Cancer Institute. PDQ® Cancer Information Summaries. Oral Complications of Chemotherapy and Head/Neck Radiation. Online at <http://www.cancer.gov/cancertopics/pdq/supportivecare/oralcomplications/healthprofessional> (accessed July 2009) or from the Cancer Information Service at 1-800-4-CANCER.

Schubert MM, Appelbaum FR, Peterson DE, Lloid ME: Oral complications. In: Blume KG, Forman SJ, eds.: Thomas' Hematopoietic Cell Transplantation. 3rd ed. Malden, Mass: Blackwell Science Inc., 2004, pp 911-28.

Shiboski CH, Hodgson TA, Ship JA, Schiødt M. Management of salivary hypofunction during and after radiotherapy. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2007; 103(suppl 1):S66.e1-S66.e19.

Sonis ST, Elting LS, Keefe D, et al. Perspectives on cancer therapy-induced mucosal injury: pathogenesis, measurement, epidemiology, and consequences for patients. *Cancer* 2004; 100(9 Suppl):1995-2025.

Oral Health, Cancer Care, and You

This fact sheet is part of the series, *Oral Health, Cancer Care, and You: Fitting the Pieces Together*, focused on managing and preventing oral complications of cancer treatment. The series was developed by the National Institute of Dental and Craniofacial Research in partnership with the National Cancer Institute, the National Institute of Nursing Research, and the Centers for Disease Control and Prevention. Publications in this series include:

For Health Professionals:

Dental Provider's Oncology Pocket Guide

Oral Complications of Cancer Treatment:
What the Dental Team Can Do

Oncology Pocket Guide to Oral Health

Oral Complications of Cancer Treatment:
What the Oncology Team Can Do

For Patients:

Chemotherapy and Your Mouth
Quimioterapia y la boca

Head and Neck Radiation and Your Mouth
Su boca y el tratamiento de radiación en la cabeza y el cuello

Three Good Reasons to See a Dentist
BEFORE Cancer Treatment
Tres buenas razones para ver a un dentista ANTES de comenzar el tratamiento contra el cáncer

Three Good Reasons to See a Dentist
BEFORE Cancer Treatment
(illustrated booklet for adults with limited reading skills)

For free copies of these publications:

Order online at www.nidcr.nih.gov and click on "Oral Health" or contact:

National Institute of Dental and Craniofacial Research
National Oral Health Information Clearinghouse
1 NOHIC Way
Bethesda, MD 20892-3500
1-866-232-4528

*This publication is not copyrighted.
Make as many copies as you need.*



National Institute of Dental
and Craniofacial Research



U.S. Department of Health
and Human Services
National Institutes of Health