

Oral health considerations during anti-cancer therapy

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Abstract

Cancer is one of the leading causes of death in any third world country. Various treatment modalities have been employed in the management of cancer. Radiotherapy and Chemotherapy are often used in the treatment of head and neck cancer, these different modalities of cancer treatment, have a significant potential of causing short and long-term oral complications. This review describes different oral complications caused by chemotherapy and radiation therapy and the methods of preventing and treating them.

Key words: Chemotherapy, Oral Complications, Radiation therapy

Introduction

Cancer is an increasingly prevalent disease all over the world that accounts for demise and deformity of many million patients annually¹. To combat this disease many aggressive modalities of therapy such as surgery, radiation therapy and chemotherapy are employed either singly or in combination. Oral complications are also very common in patients receiving anti-cancer chemotherapy or undergoing radiation therapy, especially those with head and neck cancer. Risk for oral complications varies with the treatment regimen. Oral side effects occur in virtually all patients receiving radiation for head and neck malignancies, in approximately 80% of transplant recipients and in about 40% of patients receiving primary chemotherapy. Oral side effects may make it difficult for a patient to complete the treatment regimen.

Epidemiology of oral cancer

Oral cancer is a major health problem in South-East Asia with more than a hundred thousand new cases occurring each year. The highest rates of oral cancer are in countries such as Bangladesh, Burma, India, Malaysia, Nepal, Pakistan, Singapore, Sri Lanka, Thailand and Vietnam². In these countries, oral cancer accounts for more than one-third of all cancers³. Worldwide, more than 90% of oral and pharyngeal cancers occur over the age of 45 years and are primarily squamous cell (epidermoid) carcinomas, usually of the well differentiated type. 75% of patients present with locally advanced disease (stages 3 and 4) and up to

40% (of stages 3 & 4) will have recurrence, either locally or at distant sites and often become noncurable with very poor prognosis.

Five year survival rate by stage

Site	All stages (%)	Stage 1 & 2 (%)	Stage 3 & 4 No metastasis	Stage 4 Distant metastasis
Larynx	64.1	83.5	50.4	13.7
Oral cavity & pharynx	58.8	81.3	51.7	26.4

American Cancer society, Cancer facts & figures 2007

Treatment of oral cancer

The choice of treatment for oral cancer depends on such factors as cell type and degree of differentiation; the site, size, and location of the primary lesion; lymph node status; the presence of bone involvement⁴. Surgical elimination and/or radiation are used with curative intent in the treatment of oral cancer. Chemotherapy is an adjunct to the principal therapeutic modalities of radiation and surgery. Either surgery or radiation may be used for many T1 and T2 lesions; however, combined surgery and radiation is usually needed for more advanced disease. For advanced disease, chemotherapy is used in combination with either or both of the primary treatment modalities.

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Oral complications and their management^{2,3}

Complication	Methods of oral care
1. Mucocutaneous changes <ul style="list-style-type: none"> ➤ Mucositis ➤ Transient skin pigmentation and hair loss 	<ul style="list-style-type: none"> ✓ Palliative measures like topical anesthetics (eg. Viscous lidocaine) or systemic analgesic ✓ Rinsing with nonirritating solution (saline or 2 tablespoons of sodium bicarbonate 'baking soda' in 1 quart of drinking water or magic mouthwash (combination of lidocaine and coating agents like Mg(OH)₂ and Al(OH)₃ with or without diphenhydramine)
2. Salivary Function <ul style="list-style-type: none"> ➤ Hyposalivation ➤ Xerostomia ➤ Thick viscous sticky and diminished saliva 	<ul style="list-style-type: none"> ✓ Frequent sips of water ✓ Mouth wetting agents and salivary substitutes Sugar-free gums, mints, candy ✓ Sialogogues Pilocarpine 5-10mg three times a day for 8-12 weeks
3. Oral infections <ul style="list-style-type: none"> ➤ Fungal infections ➤ Bacterial infections ➤ Viral infections (HSV,VZV) 	<ul style="list-style-type: none"> ✓ Topical antifungal drugs (clotrimazole, nystatin) ✓ Systemic antifungal drugs (fluconazole,ketoconazole) ✓ Meticulous oral hygiene maintenance ✓ Topical and systemic antibiotics ✓ Broad spectrum antimicrobial rinse. Chlorhexidine gluconate 0.12% (in aqueous base only) ✓ Systemic antivirals Eg. Acyclovir, valcyclovir
4. Radiation induced dental Caries (Caries in cervical and occlusal region involving many teeth)	Optimum oral hygiene maintenance <ul style="list-style-type: none"> ✓ High potency brush-on fluoride gels (such as 1.1% neutral sodium fluoride gel)
5. Post-radiation soft tissue and bone osteoradionecrosis	<ul style="list-style-type: none"> ✓ Antibacterial rinses(eg, chlorhexidine gluconate), topical antibiotics (eg. Tetracycline rinse) or systemic antibiotics (eg. Penicillin or clindamycin) to facilitate wound resolution
6. Taste and Smell Impairment	<ul style="list-style-type: none"> ✓ Hyperbaric oxygen therapy with surgery ✓ Generally transient regenerate within 4 months to 1 year ✓ Zinc Sulphate, 220 mg twice daily ✓ Saline nasal sprays ✓ Nutritional counseling
7. Trismus and other muscle pain	<ul style="list-style-type: none"> ✓ Exercise of mouth opening eg. Using therabite, rubber plugs, varying number of tongue blades/candy sticks stacked together ✓ Physiotherapy ✓ Analgesics and muscle relaxants
8. Neuropathic pain and neurotoxicity.	<ul style="list-style-type: none"> ✓ Some resolve with or without treatment, some may evolve into a chronic painful condition
9. Dentofacial abnormalities Mostly in children below 12 yrs Developmental disturbances like altered size and shape of teeth, delayed eruption, decreased crown size, conical shaped roots, microdontia, complete agenesis, delayed eruption, impacted maxillary canine, smaller alveolar process.	<ul style="list-style-type: none"> ✓ Early detection and treatment ✓ Cephalometric analysis
10. Recurrent disease and second primary cancers Commonly in tongue, tonsils and pharynx Risk factors being age (60 yrs or younger) and deleterious oral habits (alcohol and/or tobacco)	Habit counselling Routine follow up Annual chest radiograph

Reason for oral side effects¹¹

- Chemo/ radiation therapy stop the growth of rapidly dividing cells, such as cancer cells. Since normal cells in the lining of the mouth also divide rapidly, anticancer treatment can prevent cells in the mouth from reproducing, making it difficult for oral tissue to repair itself.
- Chemotherapeutic agents may cause transient damage to salivary glands and ionizing radiation can cause irreparable damage depending upon the dose. As a result, salivary flow decreases and intraoral tissues may become friable and susceptible to irritation and inflammation. Sequelae from hyposalivation also include shift in oral microflora toward cariogenic organisms due to alteration in salivary PH and patients are more prone to dental caries, periodontal diseases and oral fungal infection.
- Radiation reduces bone remodeling activity with a reduction in the number of cells. Loss of bone vitality occurs secondary to injury to osteocytes, osteoblasts and osteoclast, as well as relative hypoxia caused by reduction in vascular supply. These changes can lead to reduced capacity of soft tissue and bone to recover from injury predisposing to soft tissue necrosis and osteonecrosis. Additionally, RT may also induce fibrosis and atrophy in the masticatory muscles leading to trismus
- The potential toxic effect of chemotherapy is bone marrow suppression leading to decreased immunity, therefore cancer patients are more prone to infection.

Common oral complications after Radio and Chemotherapy

Direct or indirect damage

Oral complications associated with chemotherapy and radiation therapy may be caused directly by the treatment itself or may result from side effects of the treatment. Radiation therapy may directly damage oral tissue, salivary glands, and bone. Areas treated may scar or waste away. Slow healing and infection are indirect complications of cancer treatment. Both chemotherapy and radiation therapy can affect the ability of cells to reproduce, which slows the healing process in the mouth. Chemotherapy may reduce the number of white blood cells and weaken the immune system making it easier for the patient to develop an infection.

Complications can be acute or chronic

Acute complications occur during cancer therapy. Chemotherapy usually causes acute complications that heal after treatment ends.

Chronic complications are those that continue or develop

months to years after therapy ends. Radiation can cause acute complications but may also cause permanent tissue damage that puts the patient at a lifelong risk of oral complications

Prevention and Treatment of Oral Complications before Chemotherapy and/or Radiation Therapy Begins

Oral complications in patients undergoing treatment for head and neck cancer may be reduced by aggressive preventive measures taken before treatment begins. This will help the oral cavity to be in the best possible condition to withstand the onslaught of the high intensity anti-malignancy treatment.

Preventive measures include the following:

- Eating a well-balanced soft diet. Proper nutrition can help the body tolerate the stress of cancer treatment, maintain energy, fight infection, and rebuild tissue.
- Stoppage of smoking, as continued smoking slows recovery and increases the risk of recurrence or for a second cancer to develop in and around the region (field cancerization)
- Learning how to care for the mouth and teeth during and after anticancer therapy. Good dental hygiene helps prevent dental caries, ulcers, and infections.
- Having a complete oral health examination by a dentist familiar with the oral side effects of anticancer treatments.

Cancer treatment is multidisciplinary and therefore the cancer care team should necessarily include the patient's dentist. An evaluation of the patient's oral health at least a month before anti-cancer treatment begins usually provides enough time for the mouth to heal after dental work. The dentist will identify and treat teeth at risk for infection or decay, so the patient may avoid having invasive dental treatment during the therapy. The dentist may also provide appropriate preventive care to lessen the severity of dry mouth, a common complication of radiation therapy to the head and neck.

Goals of dental management^{2,3}

- Eliminate oral diseases to minimize local or systemic infection during & after therapy
- Educate the patient regarding short & long term oral complications following cancer therapy and measures to minimize them.

Pre-treatment evaluation⁸

The pretreatment evaluation for patient with cancer requires a thorough understanding of the cancer diagnosis and stage and should include

- Recent medical history
- Current cancer diagnosis & planned therapy

- Presenting symptoms
- Clinical & Radiographic examinations (*Detection of infective foci*)
- Evaluation of the Periodontium & Oral hygiene
- Dental awareness & motivation
- Dentures (fit of partial or full dentures)
- Mouth opening (on indication)
- Radiographic examination

Treatment planning

It should be guided by principles that include evaluating

- Risk of infection during neutropenia
- Risk of osteonecrosis
- Risk of infection/bleeding following dental procedures

Timing of dental treatment³

If patient is planned for chemotherapy

Extractions must take into account the WBC nadir, (*the period when WBC counts are lowest during chemotherapy*). A surgical procedure is best completed at least 1 week before chemotherapy to allow approximately 2 weeks of healing before the WBC nadir, which often occurs 7 to 14 days after start of chemotherapy.

If patient is planned for Radiotherapy

For the patient with head & neck cancer scheduled to receive radiation therapy, the concern for impaired healing must always be taken into consideration. Radiation reduces bone-remodeling activity, reduces the number of cells & also causes fibrosis. Therefore allowing three weeks of healing time after extractions is ideal but practically since patient cannot wait long for the initiation of his cancer treatment, certain measures can be considered to minimize infections and early wound healing like

- Using aseptic measures during invasive dental procedure
- Applying sutures for closure of wound to enhance healing
- Performing atraumatic extraction as far as possible

Oral care protocol

This is an important part in preventing oral complications which includes the following:

Before the start of cancer therapy

- Initiation of preventive regimen
Plaque removal (Scaling and prophylaxis)
Oral rinses (salt-soda rinses at least 8-10 times daily)
- All carious teeth should be restored
Only the most superficial occlusal caries may be

deferred, and only if there is no alternative Use of topical fluoride applications

- Extractions should be performed as soon as possible to allow for maximum healing time
- Ensure the oral cavity is free of all possible sources of local irritation
- Nutritional counseling
- Limiting the use of removable dentures

During cancer therapy

- Elective or non emergency treatment should be deferred until completion of cancer therapy
- Major and emergency invasive procedures including tooth extractions may be performed safely at platelet count levels of > 50,000/mm³ provided there are no other existing coagulopathies⁹

Minimizing Oral Complications of cancer therapy^{10,11}

It can be best achieved through increasing awareness in health professionals and equally importantly in patients as well.

For health professionals

- Utilize salivary gland-sparing radiation techniques.
- Work with the dentist to prevent and control infections with appropriate treatment before, during, and after cancer therapy
- Administer a radioprotectant, such as amifostine, to reduce risk of xerostomia in head and neck cancer patients.
- Encourage patients to maintain the oral hygiene regimen recommended by the dentist.
- Emphasize the importance of maintaining good nutrition.

General instructions to the patient

- Patients can be instructed to keep the mouth moist by
 - Drinking lots of water frequently.
 - Sucking ice chips.
 - Using sugarless gum or sugar-free hard candy.
 - Using a saliva substitute to help moisten your mouth.
- Patients can be advised to clean the mouth, tongue, and gums by.
 - Brushing their teeth, gums, and tongue with an extra-soft toothbrush after every meal and at bedtime.
 - Softening the bristles in warm water, if it hurts.
 - Using fluoridated toothpaste.

- Using the special fluoride gel that as per the dentist's prescription.
 - Not to use mouthwashes with alcohol content in them.
 - Flossing teeth gently every day. If gums bleed and hurt, not to floss the areas that are bleeding or sore, but continue flossing other teeth.
 - Rinsing mouth several times a day with a solution of 1/4 teaspoon each of baking soda and salt in one quart of warm water and following it with a plain water rinse.
 - Discontinuing wearing of ill fitting or damaged denture.
- Instructing the patient to select food that are easy to chew and swallow.
 - They should take small bites of food, frequent sipping of liquid with their meals and should chew slowly
 - Patient should eat soft, moist foods such as cooked cereals, rice, pudding, scrambled eggs etc
 - If they have trouble swallowing, should soften their food with gravy, sauces, broth, yogurt/curds, or other liquids.
 - Patients should be advised to stay away from
 - Sharp, crunchy foods, like fried chips, that could scrape or cut the mouth.
 - Foods those are hot, spicy, or high in acid, like citrus fruits and juices, which can irritate their mouth.
 - Sugary foods, like candy or soda that could cause cavities.
 - Toothpicks, which can cut their mouth.
 - All tobacco products and alcoholic drinks.

Conclusion

The oral cavity has the potential^{3,4} to be a major site of short term and long term complications of cancer therapy. Appropriate evaluation and elimination of potential sources of oral infection before and after cancer therapy is vital. The severity of these complications may be

based on the location and extent of tumor, as well as the type and extent of treatment. Some oral complication are transient where as others may require lifelong management. Hence dental professionals should be familiar with these oral side effects of anticancer treatment as they have major role in providing preventive and supportive care including education and symptom management for oral complications

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