



Dental and Oral Screening for Patient Undergoing Cancer Treatment and Hematopoietic Stem Cell Transplantation

Manmohan K Akhouri*

Certificate Palliative and Supportive Care, HCG Curie Abdur Razzaque Ansari Cancer Institute Ranchi, Medanta Hospital Ranchi, India

***Corresponding Author:** Manmohan K Akhouri, Certificate Palliative and Supportive Care, HCG Curie Abdur Razzaque Ansari Cancer Institute Ranchi, Medanta Hospital Ranchi, India.

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Abstract

Radiation to the head and neck and chemotherapy for any malignancy can cause a range of oral side effects preventing and managing oral complications help support optimal cancer therapy, enhancing both patient survival and quality of life

Oral Complications of Cancer Treatment

General: Oral mucositis/stomatitis, Xerostomia/salivary gland dysfunction Pain, Infection Gingivitis, Periodontitis, Acute Exerberation of Periapical Abscess, Xerostomia-associated cavities Taste alterations, Nutritional compromise, Functional disabilities Abnormal dental development in children.

Chemotherapy: Neurotoxicity, Bleeding gums, Gingivitis, Periodontitis, Acute Exerberation of Periapical Abscess.

Radiation Therapy: Radiation caries Trismus/tissue fibrosis Osteonecrosis.

Pre-existing Disease: Periodontitis, Loose mobile teeth, Grossly decayed teeth, Leucoplakia, Oral submucous fibrosis, Denture Stomatitis.

Conclusion: Before conditioning Cancer Treatment, Pre-treatment of dental caries, periodontal disease, and pulpal infection, should be addressed and resolved. dental screening, Dental procedure can give a great outcome in cancer treatment e.g. ultrasound Piezo Scaling for periodontal diseases, Orthopengram (OPG) Radiograph for detection of underlying dental pathology, simple dental fillings, RCT, Prosthetic rehabilitation for better chewing and nutrition, fluoride application although simple procedures which can easily improve the quality of life and reduces the oral complication to 80% and patient education should begin, including information about potential oral complications, methods to manage the symptoms, basic oral hygiene

Keywords: Dental; Oral Screening; Cancer Treatment; Hematopoietic Stem Cell Transplantation

Introduction

Radiation to the head and neck and chemotherapy for any malignancy can cause a range of oral side effects. For some patients, these complications may become dose-limiting and slow or even halt cancer treatment. Preventing and managing oral complications help support optimal cancer therapy, enhancing both patient survival and quality of life.

Oral side effects occur in virtually all patients receiving radiation for head and neck malignancies, in approximately 80 percent of transplant recipients, and in about 40 percent of patients receiving primary chemotherapy. Risk for oral complications varies with the treatment regimen. Patients administered minimally myelosuppressive or non-myelosuppressive therapy are at low risk. As chemotherapy becomes more aggressive, the likelihood of oral complications increases. Also at high risk are patients undergoing head and neck radiation for oral and pharyngeal cancer.

Oral Complications of Cancer Treatment

General

- Oral mucositis/stomatitis
- Xerostomia/salivary gland dysfunction
- Pain
- Infection Gingivitis, Periodontitis, Acute Exerberation of Periapical Abscess
- Xerostomia-associated cavities
- Taste alterations
- Nutritional compromise
- Functional disabilities
- Abnormal dental development in children

Treatment-specific

Chemotherapy

- Neurotoxicity
- Bleeding gums, Gingivitis, Periodontitis, Acute Exerberation of Periapical Abscess

Radiation therapy

- Radiation caries
- Trismus/tissue fibrosis
- Osteonecrosis

Pre-existing Disease

- Periodontitis
- Loose mobile teeth
- Grossly decayed teeth
- Leucoplakia
- Oral submucous fibrosis
- Denture Stomatitis

Frequencies of oral complications from treatment may vary, depending on the type of therapy given; some frequency estimates include: 10% adjunctive chemotherapy for solid tumours (low risk) 40% primary chemotherapy (e.g. for hematologic malignancies) (intermediate risk) 80% hematopoietic stem cell transplant (HSCT) (high risk) 100% head and neck radiation therapy to fields involving the oral cavity

Oral Complications of Cancer Treatment

Direct Toxicities	Indirect Toxicities
Oral mucositis	Myelosuppression
Salivary gland dysfunction	Neutropenia
Neurotoxicity	Immunosuppression
Taste dysfunction	Anemia
Dentinal hypersensitivity	Thrombocytopenia
Temporomandibular dysfunction	Infection
Dental and skeletal growth and development (pediatric patients)	Viral (HSV, VZV, CMV, EBV, other)
	Fungal (Candida, aspergillus, other)
	Bacterial
	Graft-vs.-Host Disease (GVHD) after allograft Gastrointestinal mucositis
	Nausea and vomiting

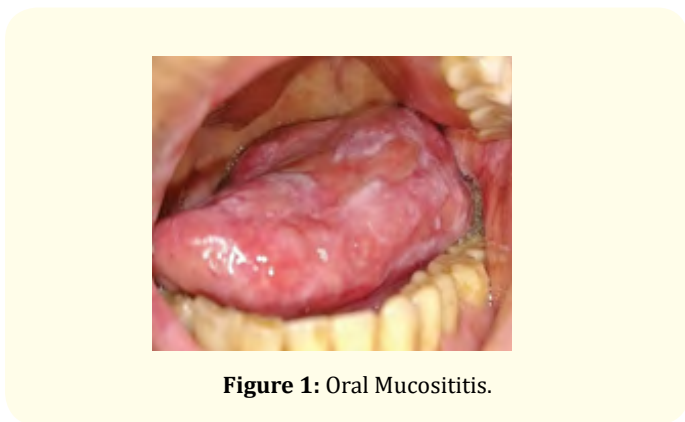


Figure 1: Oral Mucositis.

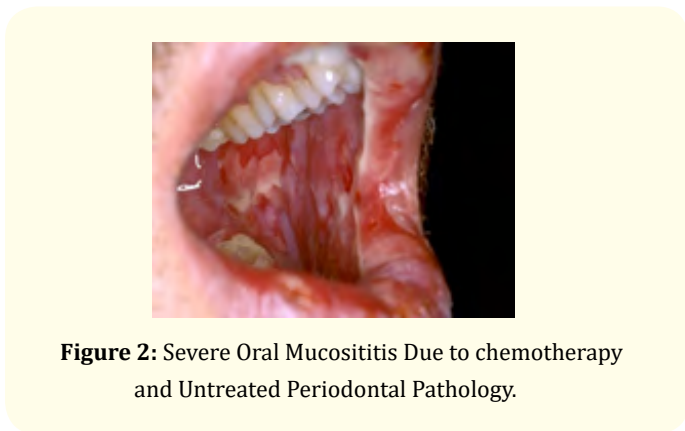


Figure 2: Severe Oral Mucositis Due to chemotherapy and Untreated Periodontal Pathology.

Cost of Oral Complications

Oral complications associated with cancer therapy do not occur without a cost to the health care system. In a study of patients with head and neck cancer, 61% of patients treated with radiotherapy alone and 75% of patients treated with radiotherapy and chemotherapy developed grade 3/4 oral mucositis. These patients consumed ten-fold more nutritional services and supplies (TPN and tube feeds), and spent an additional 7 days in hospital, when compared with patients who had no mucositis (or 3 extra days for patients with low-grade mucositis).

Treatment costs in another study of chemotherapy patients who experience myelosuppression, there were longer periods of hospitalization for those patients with oral mucositis compared with just neutropenia (6 vs. 4 days), and a higher rate of infection. Oral mucositis is related to increased patient care costs in all risk groups.

Radiation therapy

As radiation passes through a tissue, some of its energy is transferred to the cells causing ionization and producing highly reactive, although short-lived, free radicals within them. These, in turn, cause physical and chemical changes altering cellular struc-

ture and function(s) through interactions with deoxyribonucleic acid (DNA), ribonucleic acid (RNA) or intracellular enzymes causing faulty transcription, defective repair, metabolic disturbance, accelerated ageing and mutations. Since radiation cannot discriminate between normal and malignant cells both cell populations are vulnerable to damage The effects of irradiation on the oral cavity and oropharyngeal normal tissues depend on several factors, including:

- The type of radiation;
- The relative biologic efficiency (RBE) of radiation;
- The dose fraction;
- The time between fractions;
- The total irradiation dose (cumulative);
- The volume of the oral cavity which is irradiated (e.g. how much of the oral tissue is exposed to radiation);
- The introduction of rest periods during the treatment course;
- The overall treatment time (less effect on toxicities);
- The anatomic structure(s) exposed to the stated dose.

With external irradiation, most or all the anatomic structures are at risk. The incidence of necrosis increases with irradiated volume and the magnitude of the dose.

Oral Complications of Radiation Therapy

Acute	Chronic
Oral mucositis	Mucosal fibrosis and atrophy
Infection	Xerostomia
Fungal	Dental caries
Bacterial	Soft tissue necrosis
Viral	
Salivary gland dysfunction	Osteoradionecrosis (ORN)
	Taste dysfunction
Sialadenitis	Dysgeusia
Xerostomia	Ageusia
Taste dysfunction	Infections
Muscular/cutaneous fibrosis	Fungal
	Bacterial



Figure 3: Trismus



Figure 4: Muscular/cutaneous fibrosis.

Chemotherapy

Antineoplastic (cytotoxic) drugs play a dual role in cancer therapy both as the primary treatment of choice for many widely disseminated malignancies or as an adjunct to surgery or radiotherapy. Treatment of cancer with chemotherapy is becoming increasingly more effective but, like radiotherapy, is associated with short and long-term side effects. Common chemotherapy agents associated with mucositis are listed

Cancer chemotherapy agents which cause mucositis

Amsacrine, Dactinomycin, Daunorubicin, Bleomycin, Busulfan, Carboplatin, Chlorambucil, Cisplatin, Cyclophosphamide, Cytarabine, Dacarbazine, Docetaxel, Doxorubicin, Epirubicin, Etoposide, 5-Fluorouracil, Fludarabine, Gemcitabine, Idarubicin, Irinotecan, Hydroxyurea, Lomustine, Mechlorethamine, Mercaptopurine, Methotrexate, Mitoxantrone, Mitomycin, Paclitaxel, Procarbazine, Vinblastine, Vincristine, Vinorelbine.

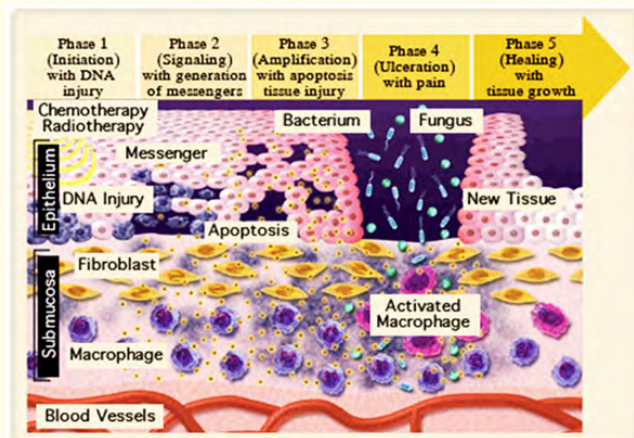




Figure 5

SCC Alveolus Tooth Buried in Tumour site NACT/CTRRT planed and there are chances of tooth aspiration During Chemotherapy. So all Loose mobile teeth has to be Extracted and USG Piezo Ultrasonic Scaling to Maintain Oral Hygiene and reduces severity of mucositis and improve mouth opening during Radiotherapy.

Complication	Direct Risk Factor	Indirect Risk Factors
Oral mucositis	Mucosal cytotoxicity	Decreased local/systemic immunity
	Physical/chemical trauma	local infections
	Re-activation of HSV	
Oral Infection Viral Fungal Bacterial	Inadequate oral hygiene Mucosal breakdown	Decreased systemic immunity
	Acquired pathogens	Decreased systemic immunity
		Salivary gland dysfunction
		Altered oral flora (decreased bacterial flora)
	Decreased systemic immunity	
	Salivary gland dysfunction	
Taste dysfunction	Taste receptor toxicity	
Xerostomia	Salivary gland toxicity	Anticholinergic drugs
Neuropathies	Vinca alkaloid drug use	
Gastrointestinal mucositis		Nausea and vomiting
Hemorrhage	Oral mucositis	Thrombocytopenia

Hematopoietic Stem Cell Transplantation (HSCT)

Patients undergoing hematopoietic stem cell transplantation experience more profound and severe oral complications than those receiving less intensive doses of chemotherapy and/or radiotherapy. Conditioning regimens to partially or fully ablate the hematopoietic tissues have been reduced in myelotoxic intensity in more recent years, but these regimens are not necessarily less stomatotoxic. Oral complications may change through the phases of HSCT, as noted in table.

Oral Complications of Hematopoietic Stem Cell Transplantation

Transplant Phase	Oral Complication
Phase I: Preconditioning	Oral infections: dental caries, endodontic infections, periodontal disease (gingivitis, periodontitis), mucosal infections (i.e., viral, fungal, bacterial). Gingival leukemic infiltrates. Metastatic cancer. Oral bleeding. Oral ulceration: aphthous ulcers, erythema multiforme. Temporomandibular dysfunction.
Phase II: Conditioning Neutropenic Phase	Oropharyngeal mucositis. Oral infections: mucosal infections, periodontal infections. Pain in the mouth and/or lips. Reduced ability to eat, drink and talk. Reduced ability to perform oral hygiene. Hemorrhage. Xerostomia. Taste dysfunction. Neurotoxicity: dental pain, muscle tremor (e.g., jaws, tongue). Temporomandibular dysfunction: jaw pain, headache, joint pain.

Phase III: Engraftment Hematopoietic Recovery	Oral infections: mucosal infections. Acute graft-versus-host-disease (GVHD). Pain in the mouth and/or lips. Reduced ability to eat, drink and talk. Reduced ability to perform oral hygiene. Xerostomia. Hemorrhage. Neurotoxicity: dental pain, muscle tremor (e.g., jaws, tongue). Temporomandibular dysfunction: jaw pain, headache, joint pain. Granulomas/papillomas.
Phase IV: Immune Reconstitution Late Posttransplant	Oral infections: mucosal infections. Chronic GVHD. Dental/skeletal growth and development alterations (pediatric patients). Pain in the mouth and/or lips. Xerostomia. Relapse-related oral lesions. Second malignancies.

Conclusions

Before conditioning Cancer Treatment, oral complications are secondary to the underlying disease, and prior treatments for cancer or other medical conditions. Pre-treatment problems with oral health including dental caries, periodontal disease, and pulpal infection, should be addressed and resolved. At this phase, dental screening should be performed few of Dental procedure and diagnostic method can give a great outcome in cancer treatment e.g. ultrasound Piezo Scaling for periodontal diseases, Orthopengram (OPG) Radiograph for detection of underlying dental pathology, simple dental fillings, RCT, Prosthetic rehabilitation for better chewing and nutrition, fluoride application although most of general dental procedure which can easily improve the quality of life and reduces the oral complication to 80% and patient education should begin, including information about potential oral complications, methods to manage the symptoms, and basic oral hygiene [1-11].



Figure 6: Orthopantomogram (OPG) Showing Underlying Alveolar Pathology (Cyst).

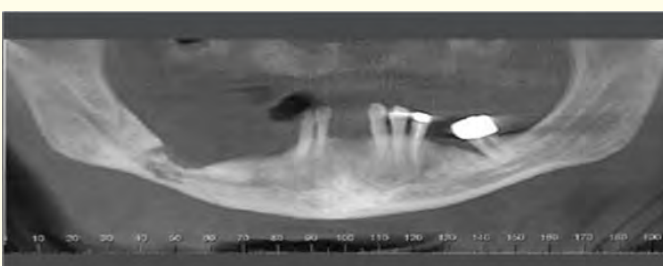


Figure 7: Panoramic radiograph showing extensive involvement of the mandible, with bone lesion in the right posterior portion.

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