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EFFECTS OF RADIOTHERAPY AND CHEMOTHERAPY ON PATIENT'S INTRAORAL HEALTH

[1]Gaurav Gupta, [2]Sajjy Upinder, [3]Asmita Singla

[1]Professor and Head, Department of Prosthodontics and Crown & Bridge. Guru Nanak Dev Dental College and Research Institute, Sunam, Punjab, India.
[2]Reader, Department of Prosthodontics and Crown & Bridge. Guru Nanak Dev Dental College and Research Institute, Sunam, Punjab, India.
[3]Post- Graduate student, Department of Prosthodontics and Crown & Bridge. Guru Nanak Dev Dental College and Research Institute, Sunam, Punjab, India.

Corresponding author
Dr. Asmita Singla, Post- Graduate student, Department of Prosthodontics and Crown & Bridge. Guru Nanak Dev Dental College and Research Institute, Sunam, Punjab, India.Email id: asmitasingla98@gmail.com, Contact No.9501953848.

Abstract

Oral complications are common in cancer patients, especially those with head and neck cancer. Preventing and controlling oral complications can help you continue cancer treatment and have a better quality of life. Patients receiving treatments that affect the head and neck should have their care planned by a team of doctors and specialists.Radiotherapy can be used as the primary treatment or in combination with surgery, chemotherapy, or immunotherapy, depending on the type and stage of cancer. Chemotherapy patients may experience acute and chronic oral complications. This review provides an insight into the severity of oral complications may necessitate modification or cessation of the radiotherapy and chemotherapy, negatively impacting patient's survival. To manage the oral health effects of radiotherapy and chemotherapy, a multidisciplinary approach is essential. Dental professionals should be involved in the patient's treatment planning to assess and address potential risks. Patients should maintain open communication with their oncology and dental teams, and they should follow recommended oral care practices to minimize the impacton the oral cavity.

Key Words: Head and neck cancers, Radiotherapy, Chemotherapy, Oral effects

Introduction

Oral health plays an important part in one's overall quality of life. However, oral health status can be severely hampered by side effects of cancer therapies including surgery, chemotherapy, radiotherapy, and hematopoietic stem cell transplantation. Moreover, prevention and treatment of these complications are often overlooked in clinical practice. Chemotherapy and radiation therapy are the most widely used interventions for the treatment of cancer. Although these treatments are employed to improve the patient's quality of life, they are associated with several side effects. Severe adverse reactions due to these therapies result in patient morbidity and mortality.

Patients undergoing radiation therapy for the head and neck are susceptible to a significant and often abrupt deterioration in their oral health. The oral morbidities of radiation therapy are not only limited to an increased susceptibility to dental caries and periodontal disease, but also include profound and often permanent functional and sensory changes involving the oral soft tissue. Many of the oral soft tissue changes following radiation therapy are difficult challenges to the patients and their caregivers and require life-long strategies to alleviate their deleterious effect on basic life functions and on the quality of life.

Chemotherapeutic agents are toxic compounds that target rapidly proliferating cells, both malignant and normal. The level and type of toxicity of the regimen depends on the patient, the type of tumour, and therapy-related variables. Patient-related variables include the overall health and immunity of the patient before and during chemotherapy. Therapy-related variables involve the regimen, frequency of treatment, dosage, and route of administration.The direct effects of the oral manifestations of chemotherapy are secondary to tissue necrosis and desquamation. The indirect effects arise from a decreased number and function of platelets and neutrophils and may be exacerbated by preexisting conditions unrelated to cancer, such as periodontal disease, caries, and defective restorations.

Oral effects and management of radiation therapy

Head and neck cancer patients usually receive the total dose of 60–70 Gy divided into 2Gy daily fractions (5 days a week) over 6–7 weeks. Along with therapeutic action on tumour cells, ionizing radiation causes damage to surrounding healthy tissues located in the radiation field. Radiation induced damage to surrounding healthy tissues is responsible for complications that arise during and after radiotherapy. There are several reasons why these complications are very frequent in the oral cavity:

- Fast turnover rate of oral mucosal cells
- Rich and complex oral microflora
- Mucosal microtrauma during mastication

Radiation-related oral side effects can be acute or chronic. Acute side effects begin during the radiotherapy and lasts for several weeks after the therapy cessation. Acute side effects include:

- Oral mucositis
- Taste disorder
- Xerostomia
- Oropharyngeal Candidiasis

Chronic oral side effects begin several weeks, months, or even years after the radiotherapy. Chronic side effects are as follows:

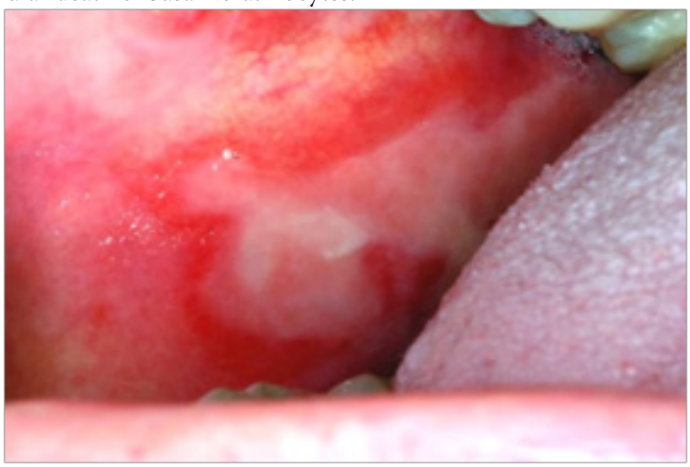
- Trismus
- Radiation-induced dental caries and periodontal diseases
- Osteoradionecrosis
- Post radiation fibrosis

Patients undergoing radiotherapy demand a multidisciplinary approach in order to reduce the intensity of radiation-induced oral side effects and understand the role of the dentist and themselves in their prevention and therapy.

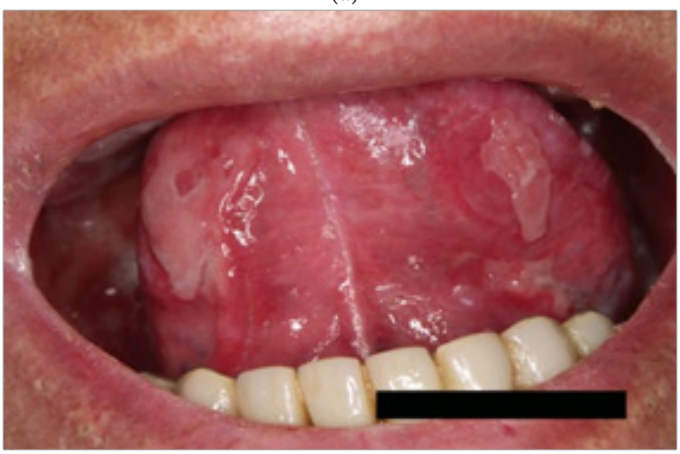
I. Acute side effects of head and neck irradiation

A. Oral mucositis:

Oral mucositis (OM) is the most common complication of head and neck irradiation affecting 80–90% of the patients. Oral mucositis is defined as reactive inflammation of oral mucosa due to radiation-induced damage of cellular DNA and subsequent cellular death of basal keratinocytes.



(a)



(b)

Fig. No.1: (a) and (b) showing: Oral Mucositis lesion on the buccal mucosa of a patient.

Mucositis manifests as ulcerative inflammation of the oral mucosa which can cause severe pain, deteriorated oral function, increased drug consumption, and can lead to temporary treatment interruption with consequent reduction in therapeutic effect (Fig1). Although the anatomic distribution of mucositis is predominantly related to the radiation dose distribution, non-keratinized oral tissues (buccalmucosa, lateral tongue, soft palate, floor of mouth) are more susceptible to oral mucositis than keratinized oral tissues. First clinical sign of oral mucositis is whitish appearance of oral mucosa which begins at the end of the first week of irradiation. In the third week, patients usually develop ulcerations covered with fibrinous pseudo membranes that are prone to secondary infection. Mucositis persists throughout the radiotherapy with a peak at the end of irradiation and lasts for 2–4 weeks after treatment cessation.

Management of oral mucositis

The treatment of oral mucositis therefore remains symptomatic, aimed at relieving pain, preventing infection of oral lesions, and maintaining normal functioning of the oral cavity. Many centres use a locally compounded mouth rinse (often referred to as "magic mouthwash") containing lidocaine, often in combination with other ingredients such as diphenhydramine, a coating agent such as Maalox, and occasionally an antifungal.

B. Xerostomia:

Xerostomia is one of the most frequent and debilitating side effects of head and neck radiotherapy. It develops acutely (early in the course of irradiation), but frequently remains chronic (permanent) complication (Fig 2). Lack of saliva affects the health of the entire oral cavity and favors the occurrence of other oral complications, which impair patient's quality of life, such as development of dental caries, oral infections, dysgeusia, dysphagia, oral discomfort, and pain.

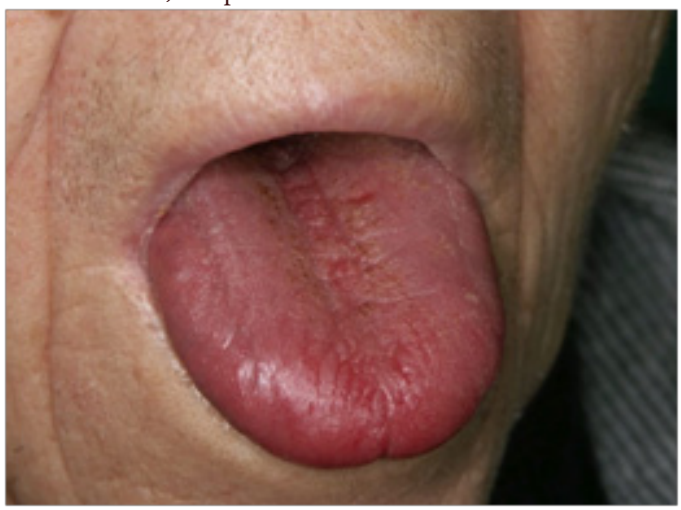


Fig. No. 2: Xerostomia

Beginning with the first course of treatment, salivary flow rates decrease, eventually reaching as low as 1% of normal. Xerostomia may be caused by radiation therapy and drugs, severing of salivary duct and gland (accidental or intentional), decreased liquid intake or stress and anxiety. Major salivary glands produce 70–80% of the total salivary flow. Parotid gland predominantly produces stimulated, watery saliva, and its serous acinar cells are more radiosensitive than mucous cells of submandibular and sublingual glands.

Xerostomia often remains permanent if radiation dose is greater than 40 Gy. Head and neck tumors are usually treated with a total dose greater than 60 Gy, during 6 weeks, which can lead to a decrease in salivary production by 80%.

Measures taken to reduce the severity of xerostomia are:

- Radiation stents can be fabricated to shield the ipsilateral side when unilateral radiation treatment is required. Another method of limiting radiation to salivary glands is conformal and intensity-modulated irradiation technique (IMRT). This technique targets the lesion while sparing the major salivary glands from radiation.

- Artificial salivary substitutes are prescribed.
- Secretagogues, i.e. pilocarpine, anetholetrithione and cevimeline, acts by stimulating the functioning of salivary gland tissue.

C. Taste disorder:

During the radiotherapy, the majority of patients experience complete or partial taste loss. According to a recent literature review, taste disorder affects 66.5% of patients undergoing radiotherapy alone and 76% of patients undergoing combined chemoradiotherapy. Loss of taste is the most common side effect accompanying radiation to the tongue and palate during 1 to 2 weeks after radiotherapy which gradually returns back to normal after the course is completed.

Taste disorder is a result of two factors: (i) a direct radiation effect on the taste buds and (ii) changes in salivary flow and composition. Taste buds are very sensitive to irradiation and demonstrate signs of degeneration and atrophy at doses of 10 Gy. Decreased salivary flow disrupts transport of flavour molecules to taste buds while changed ionic composition of saliva further impairs taste perception. Impact of taste disorder on the quality of life is difficult to assess because patients often report taste disorder along with other, more severe side effects of head and neck irradiation like xerostomia, sticky saliva, and difficulty swallowing.In the majority of cases, taste gradually returns to normal or near-normal levels within 1 year after radiotherapy. Because of this transitory aspect, there is usually no need for treatment.

Management includes dietary counselling with guidance in food choices, food preparation and seasoning, and avoiding unpleasant foods. Zinc sulphate supplementation has been therapeutically tested with inconsistent outcomes in clinical studies.

D.Oropharyngeal candidiasis (OPC):

Oropharyngeal candidiasis(Fig 3) is associated with mucosal pain, taste change and can extend to the oesophagus and result in dysphagia; in addition to oropharyngeal symptoms, oral intake can adversely affect nutritional status and ability to take oral medications. Regional extension or systemic dissemination may occur in myelo/immunosuppressed patients. Clinical presentation includes pseudomembranous (thrush) and erythematous candidiasis, and angular cheilitis. Hyperplastic (nodular) and invasive candidiasis are less common and may require biopsy for diagnosis.

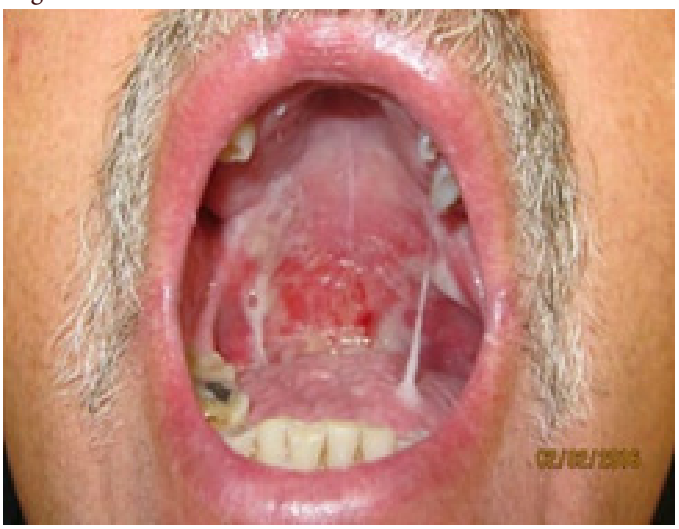


Fig. No. 3: Oropharyngeal candidiasis (OPC)

Candidiasis has variable symptoms: from no symptoms to burning sensitivity and pain, a sensation of coating in the mouth, odynophagia, dysgeusia (often described as a metallic taste), and smell of yeast infection.

Management of oropharyngeal candidiasis: Current guidelines for management of oropharyngeal candidiasis derive primarily from clinical trials in immunosuppressed HIV patients. Topical oral treatments are recommended as first-line therapy in milder forms of candidiasis. Topical azole or polyene antibiotics in the form of a lozenge, suspension or cream may be applied intra-orally. Instructions include applying nystatin and amphotericin B four to six times daily, maintaining contact time on the mucosa as long as possible. Topical fluconazole rinses can be compounded and have been examined and shown effective in cancer patients with candidiasis.

II. Chronic side effects of head and neck irradiation:

A. Radiation-induced dental caries and periodontal diseases:

Radiation-induced caries characteristically has a quick progress and affects smooth tooth surfaces where caries in irradiated patients seldom occur (Fig 4). The affected teeth become discolored and demineralized, with erosions in the cervical region, which makes them fracture easily. The risk of occurrence of radiation caries is lifelong so patients should be instructed to maintain adequate oral hygiene and to come to regular dental checkups every 1–3 months.

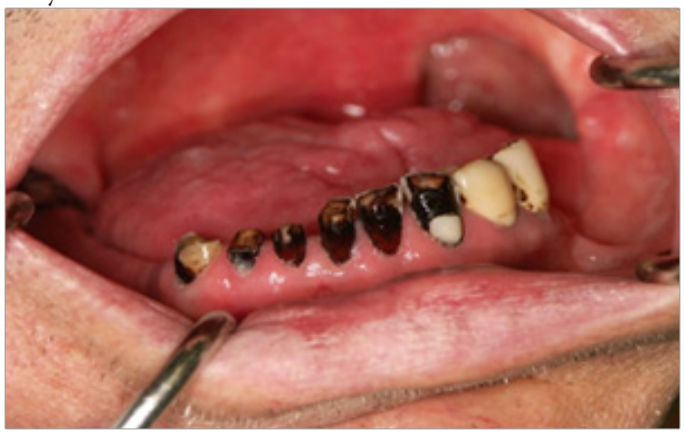


Fig. No. 4: Radiation caries

The effect of radiotherapy on periodontal health is dose-dependent and is associated with worsened periodontal health following the initiation of radiotherapy. Independent of the risk of tooth-loss, periodontal disease is relevant to the management of the oncology patients as it has been linked to an increasedrisk of osteoradionecrosis and also to oral mucositis (OM).

It is recommended that patients who have or will undergo radiotherapy maintain an aggressive comprehensive oral health management plan. This includes regular dental care which will allow early identification of demineralization and carious lesions and fluoride and calcium applications to support dental remineralization. The application of fluoride can be accomplished in professionally applied fluoride varnishes, with mouth washes, high fluoride prescription toothpaste, complex fluoride slow-release devices. Fluoride applications must be continued as long as hyposalivation persists.

B. Osteoradionecrosis:

Osteoradionecrosis (ORN) is the most serious complication of head and neck radiotherapy, which affects the bone in irradiated areas. Radiotherapy alters collagen synthesis and induces inflam-

mation and obliteration of the blood vessels that provide blood supply to the bone. Irradiated bone becomes hyper vascularized and hypoxic, with impaired healing capacity. The process is irreversible and progressive, and the risk of osteonecrosis is lifelong. The most frequently affected bone in the head and neck region is the mandible.

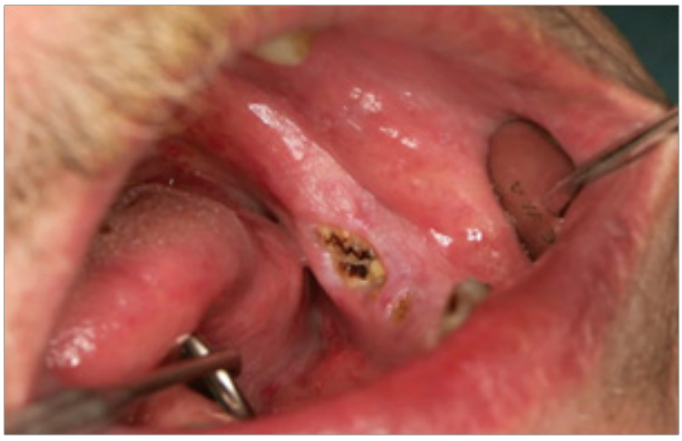


Fig. No. 5: Osteoradionecrosis

Osteoradionecrosis manifests as an area of exposed bone in the oral cavity (Fig 5). Symptoms of osteoradionecrosis include pain, dysgeusia, dysesthesia, halitosis, or food impaction in the area of exposed bone, although in early stages it can be asymptomatic. Untreated, it can lead to fistulas and pathological fractures of the bone (Fig6).

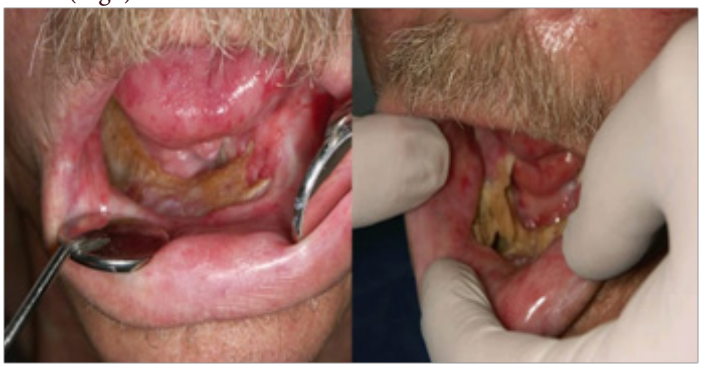


Fig. No. 6: Osteoradionecrosis progressing to pathological fracture of the mandible.

Risk factors for the development of osteoradionecrosis include poor oral hygiene, malnutrition, chronic trauma from ill-fitting dentures, or acute trauma from surgical procedures in the jaw, especially in the posterior mandible.

Management protocols proposed to treat osteoradionecrosis include conservative therapy with medication, ultrasound, hyperbaric oxygen therapy (HBO), and surgical resection and reconstruction for nonresponding, advanced stage ORN. The characterization of fibrosis as part of the pathogenesis of osteoradionecrosis has led to the use of anti-radiation fibrosis drugs such as pentoxifylline, tocopherol, and clodronate.

C. Trismus:

Trismus is defined as a painful restriction in opening the mouth due to a muscle spasm, including restrictions caused by trauma, surgery or radiation. It can occur if the temporomandibular joint and masticatory muscles are located in an irradiated area during head and neck cancer therapy. Irradiation causes spasm and fibrosis of masticatory muscles, which limits mouth opening (Fig7). There is a wide range of reported prevalence of trismus after head and neck radiotherapy, ranging from 5 to 38% of patients.

Trismus is often underreported as a radiotherapy side effect, although it seriously impairs quality of life, resulting in difficulties in patient's social life, affecting speech, food intake, and oral hygiene maintenance and even leading to depression.

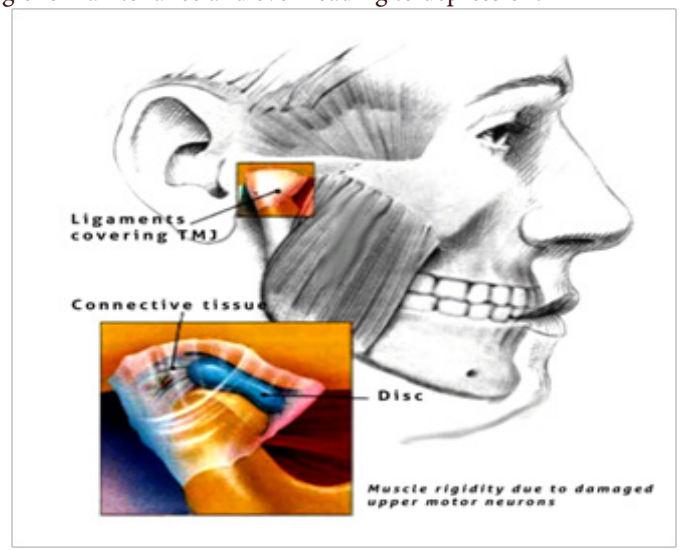


Fig. No 7: Trismus caused due to muscle rigidity. Diagram of jaw muscles is shown here.

Risk factors for the occurrence of the trismus are similar as for other late oral side effects of radiotherapy and include the total dose of radiation, fractionation regimen (mode of irradiation), treatment modality (conventional radiotherapies. intensity-modulated radiotherapy (IMRT), overall duration of radiotherapy, tumor location, and poor physical condition. Some results show that a total dose of radiotherapy greater than 55 Gy increases the incidence of trismus up to 47%, while treatment modality as conventional radiotherapy compared to IMRT decreases the mean incidence of trismus from 25.4 to 5%.

Oral management of trismus: To minimize the effects of radiation on the muscles around the face and the muscles of mastication, a mouth block should be placed when the patient is receiving external-beam irradiation. The patient also should perform daily stretching exercises to relieve trismus and apply local warm moist heat. One exercise is for the patient to place a given number of tongue blades in the mouth at least three times a day for 10-minute intervals. By slowly increasing the number of tongue blades, muscle stretching will occur, and more normal function will ensue (Fig 8 and Fig 9).

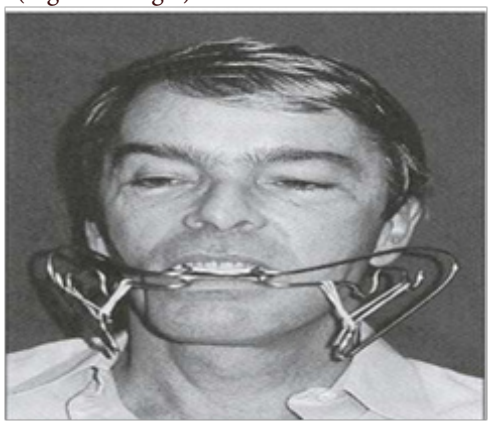


Fig. No. 8: Dynamic bite openers of a variety of designs have been proven effective in cases of severe trismus.

Fig. No.9: The simplest and least expensive method of exercising is with the use of tongue blades

D. Post radiation fibrosis:

Radiation fibrosis syndrome (Fig.10)is a serious and lifelong disorder that, nevertheless, may often be prevented when identified and rehabilitated early. Genetic factors likely play a significant role in the development of chronic fibrotic response to radiation injury that persists even after the initial insult is no longer present. Late effects from radiotherapy may involve several different structures in the regions that were irradiated. In particular, radiation to the neck may cause damage to the vessels, nerves, and muscles.

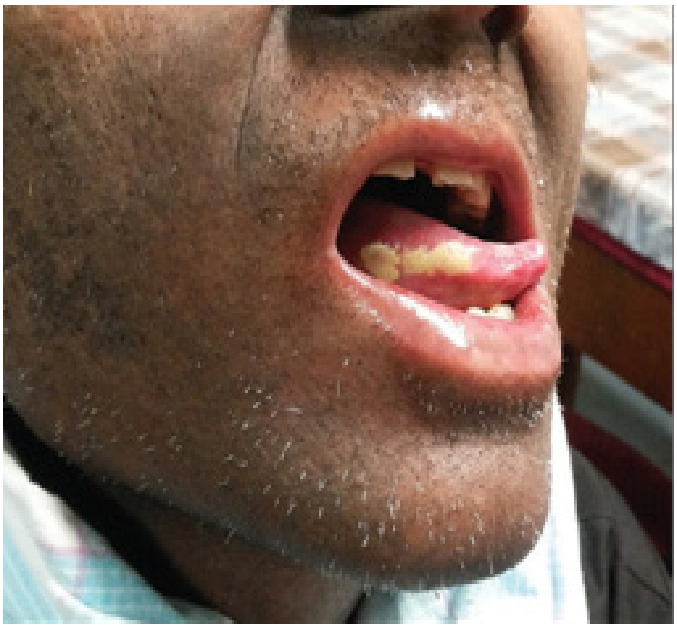


Fig. No.10: Post radiation fibrosis

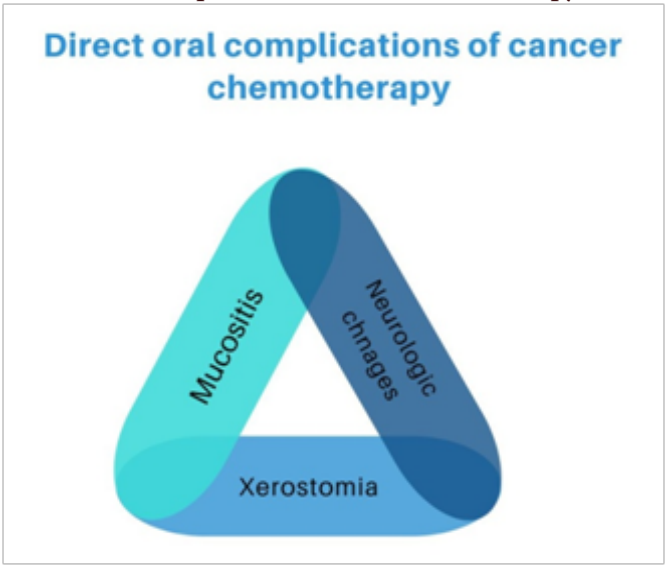
Post radiation fibrosis, limiting the functions of the lips and tongue may develop as late radiotherapy side effects. Radiotherapy to the muscles of mastication (masseter, temporalis, and the medial and lateral pterygoids) and region of the temporomandibular joint causes inflammatory changes which can lead to muscle fibrosis. Fibrosis in lingual muscles as well as constrictor muscles of the pharynx can follow therapy and may affect tongue function and swallowing, respectively. Fibrosis in masticatory muscles, particularly lateral pterygoids can result in trismus. Management of this syndrome is a complex process comprising medication, education, rehabilitation, and physical and occupational therapy. Pentoxifylline and vitamin E may reduce fibrosis. Anti-inflammatory and antioxidant therapies are the traditional treatments for radiation-induced fibrosis.

Oral effects and management of chemotherapy

Chemotherapeutic regimens are used effectively for disseminated cancer and may ultimately provide relief of symptoms, prolong life, and/or cure the disease. It is frequently used in conjunction with surgery and radiation therapy to ensure treatment success, and may be used initially to decrease the size of the primary tumor prior to surgery. Chemotherapeutic regimens are intended to destroy rapidly proliferating cancer cells. However, these agents are nonspecific and normal host cells with high mitotic activity may also be adversely affected.

The direct effects of the oral manifestations of chemotherapy are usually dose-dependent,secondary to tissue necrosis and desquamation and present as mucositis, xerostomia, and pain with associated neurologic symptoms. The indirect effects arise from a decreased number and function of platelets and neutrophils and these include bleeding, infection, and nutritional deficiency.

I. Direct oral complications of cancer chemotherapy:



A. Oral mucositis

Oral mucositis is a severely debilitating condition characterized by erythema, edema, and ulcerations of the oral mucosa. It is a complication of radiation therapy (RT) to the head and neck, chemotherapy, chemoradiotherapy, and hematopoietic stem cell transplantation (HSCT).

The incidence of oral mucositis varies amongst the different chemotherapy agents. Chemotherapeutic agents that affect DNA synthesis (S-phase), e.g. 5-fluorouracil, methotrexate, and cytarabine, have a high incidence of oral mucositis. Anthracyclines, mTOR inhibitors, alkylating agents, and antimetabolites also have an increased risk of oral mucositis. Clinically, the earliest change is characterized by leukoedema. This change presents as a diffuse, poorly defined area of pallor or milky-white opalescence most noticeable on the buccal mucosa. Leukoedema will disappear when the mucosa is stretched. Clinical mucositis begins 5-10 days following the initiation of chemotherapy and resolves in 2-3 weeks in more than 90% of patients and correlates with a normal white blood cell count. (Fig.11).

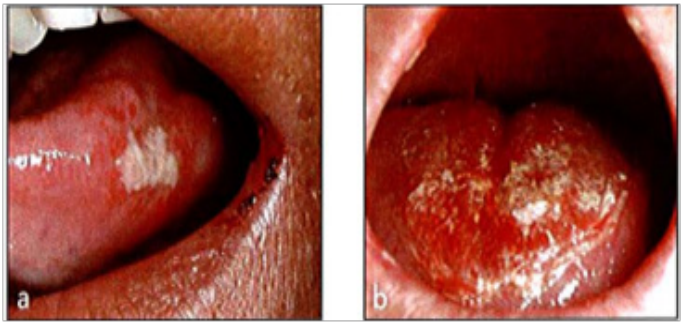


Fig. No.11 (a and b): Chemotherapy-induced mucositis, seen as generalized ulceration

Oral mucous membrane changes, such as discoloration, desquamation, and ulceration are most often seen in drug protocols involving alkylating agents and antimetabolites. The antimetabolite, methotrexate, is associated with severe mucositis. Antitumor antibiotics, such as bleomycin, have a particularly adverse effect on squamous epithelium and may cause serious mucosal ulceration.

Management: The pain and irritation of oral mucositis caused by cancer chemotherapy were managed palliatively. Numerous remedies have been advocated for relief of pain. If the mucositis is relatively mild, patients are given a topical anesthetic or a mucosal coating agent with which to rinse or gargle.Cryotherapy is also used in patients with mild to moderate mucositis. Moderate to severe pain associated with mucositis is usually treated with a combination of topical and systemic analgesics. The analgesics can be narcotic or non-narcotic. If severe pain and dysfunction are associated with oral mucositis, chemotherapeutic doses may be reduced or discontinued until sufficient tolerance is regained by the patient.

B.Xerostomia:

Xerostomia, also known as dry mouth, is dryness in the mouth, which may be associated with a change in the composition of saliva, or reduced salivary flow, or have no identifiable cause(-Fig.12). It is thought to be caused by the direct effects of chemotherapy on major and minor salivary glands. Dry mouth is often a complaint of patients undergoing chemotherapy. It is usually not readily apparent until later in the treatment or more commonly following treatment.

Saliva is an effective lubricant, and therefore xerostomia can increase the pain and discomfort associated with oral mucositis. In the absence of saliva, the soft tissues of the tongue, floor of the mouth, palate, buccal mucosa, and oropharynx cling to one another, the teeth, and prosthetic appliances. Alterations in salivary flow may predispose the patient to oral candidiasis, dysphagia, and malnutrition. A decrease in saliva causes the oral mucosa to appear shiny, atrophic, and desiccated. Lack of saliva promotes the accumulation of bacteria, plaque, and material alba, which increases the patient's susceptibility to caries and periodontal disease. Lipstick sticking to the teeth and the tongue sticking to the intraoral mirror are signs of a dry mouth. Milking the parotid gland for saliva or observing its build up in the floor of the mouth are other measures to assess salivary flow. Intact salivary function is an important component of oral host defences against infection. Decreased salivary flow renders the patient at an increased risk of secondary infections because of a decrease in the amount of immunoglobulin A secreted, limitations of natural cleansing and alterations in the oral environment.

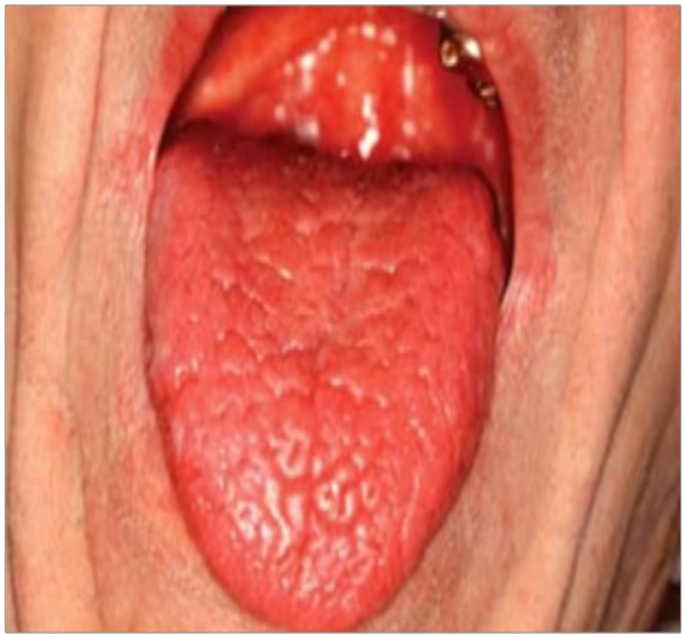


Fig. No.12: Patients often present with beefy red tongue from xerostomia

Management:Saliva stimulants such as pilocarpine may increase salivary flow and are beneficial for some patients. It is also recommended that patients adopt diets that are moist and less cariogenic. If salivary flow is extremely compromised, daily fluoride applications of either stannous or neutral sodium fluoride are indicated. The daily use of remineralizing agents is also recommended.

C. Neurologic changes:

Peripheral neuropathy is a debilitating and common occurrence in patients undergoing chemotherapy for malignancies. It is often a dose-limiting factor in cancer treatment. In particular, antineoplastic agents such as vincristine, cisplatin, oxaliplatin, paclitaxel, and docetaxel have been known to cause peripheral neuropathy. Patients suffer from dysesthesias and pain.

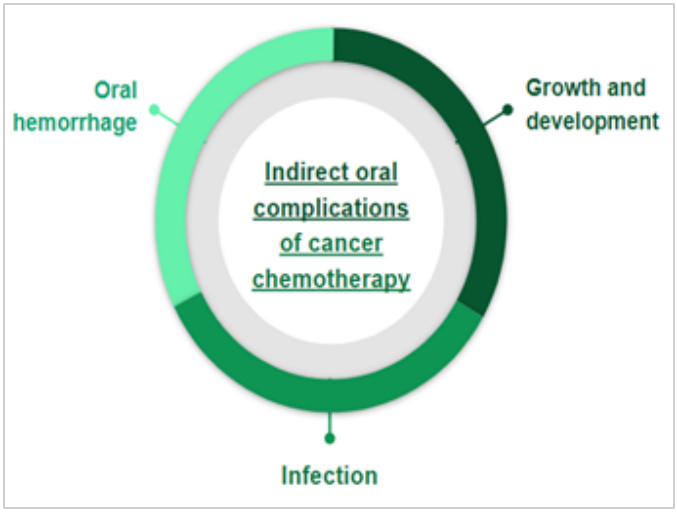
Drugs such as oxaliplatin, a third-generation platinum derivative, have short-term effects, but these effects can often be avoided by prolongation of the infusion of the drug. However, drugs such as paclitaxel and cisplatin, which are often used in conjunction with radiation to treat head and neck cancers, can cause severe dysesthesias, weakness, and possible long-term damage. Neuroprotective agents and nerve growth factors are being tested with the hope of minimizing neurotoxic effects.

Oral symptoms of peripheral neuropathy include severe, throbbing pain that may mimic dental pain secondary to dental disease such as irreversible pulpitis. Chemotherapy patients may also develop a transient mild to moderate dental hypersensitivity within weeks of initiation of chemotherapy.

Other oral manifestations associated with chemotherapy-induced neurotoxicity consists of dysgeusia resulting from temporary disruption of taste bud regeneration in combination with xerostomia.

Neurological symptoms frequently disappear after the chemotherapeutic agent is discontinued. Therefore, the diagnosis of oral pain may be challenging because the symptomatology may be either quiescent or aggravating, depending on the stage of chemotherapeutic regimen.

II. Indirect oral complications of cancer chemotherapy:



A. Oral haemorrhage:

Oral haemorrhage is defined as bleeding from the blood vessels of the mouth, which may occur as a result of injuries to the mouth, accidents in oral surgery, or diseases of the gums.Thrombocytopenia results from inadequate production of megakaryocytes, which decreases the number of platelets, and can be manifested in patients with diseases such as acute leukaemia, aplastic anaemia, and idiopathic thrombocytopenic purpura or associated with antineoplastic chemotherapy.

The need to gain control of spontaneous haemorrhage may necessitate platelet transfusion when a patient is thrombocytopenic. The average half-life of host platelets is 8 to 10 days, while that of donor platelets is only 5 days or less after being stored for several days. For this reason, chemotherapy patients with thrombocytopenia often require multiple platelet transfusions to prevent haemorrhage.

The clinical signs of haemorrhage include petechiae, ecchymosis, and bleeding. Petechiae are characterized by pinpoint red spots on the tissue that are 1 to 3 mm in size. Damage to cells lining small vessels in the submucosa allows erythrocytes to escape into the connective tissues. Ecchymosis is more diffuse and results from submucosal bleeding and microvascular incompetence (Fig.13).

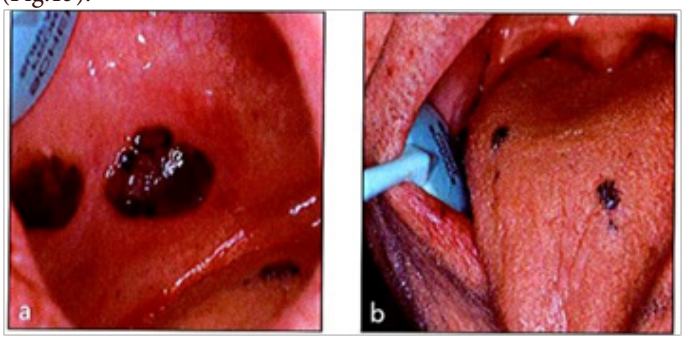


Fig. No.13: Ecchymosis, which results from submucosal bleeding and micro-vascular incompetence, on the buccal mucosa (a) and the tongue (b). Note the petechiae.

Haemorrhage most often occurs from areas of traumatic injury or ulceration. The trauma can be physical (toothbrush injury), chemical (strong mouthrinses), thermal (hot food or drink), or microbial (endogenous or exogenous).

If the gingival sulcus is identified as the bleeding site, pressure should be applied over the facial and lingual or palatal gingiva with cold gauze. Pressure to the area should be gentle yet firm and consistent. Periodontal dressings do not provide sufficient pressure for the extended periods necessary to stop gingival sulcular bleeding. Topical haemostatic agents can be used in the gingival sulcus to aid in haemostasis. Customized soft silicone stents may be useful as carriers of the haemostatic agent (Fig.14).

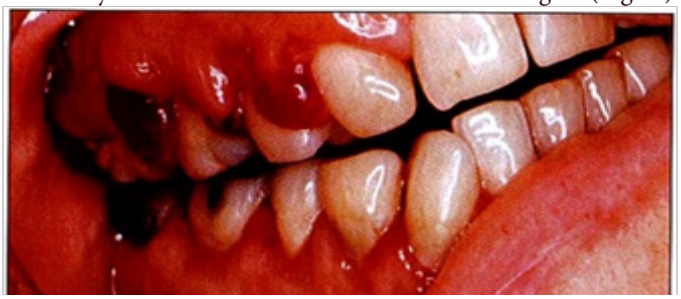


Fig. No. 14: Patient who bled continuously through the gingival sulcus while thrombocytopenic.

As local management of bleeding is difficult in the thrombocytopenic patient, any potential cause of bleeding, such as sharp edges on prostheses or abrasive toothbrushing, should be eliminated or modified.

B.Infection:

Bacterial infections dramatically contribute to morbidity and mortality in patients receiving chemotherapy and oral sources account for 25 to 50% of the infections in these patients. Chemotherapy-related oral infections may involve the teeth, gingiva, salivary glands, or mucosa.

Oral bacterial infections are often associated with periodontal and endodontic disease. Examples include gram-positive organisms such as viridians streptococci and Streptococcus mutans. It is essential to target antimicrobial therapy to the specific bacterial organism to minimize antibiotic resistance, however. broad-spectrum antibiotics can be administered while the culture results are pending. Patients can also be instructed on mechanical reduction of the bacterial population through toothbrushing, flossing, and rinsing with antimicrobial or hydrogen peroxide-based mouthrinses, if tolerated by the patient.

Fungal infections, primarily with Candida albicans, are probably the most frequent oral infection. Candidiasis arises when immunosuppression and xerostomia are present but can be exacerbated if the patient is taking antibiotic medications as well.

In pseudo-membranous candidiasis, white creamy plaques can be rubbed off the mucosal surface.In erythematous candidiasis, there are few obvious fungal organisms, but there is diffuse redness of the oral mucosa. Hyperplastic candidiasis is less common and presents as tenacious white plaques on mucosal surfaces. Lesions in severely immunosuppressed patients can be quite extensive, with all forms presenting at the same time (Fig.15a and b).

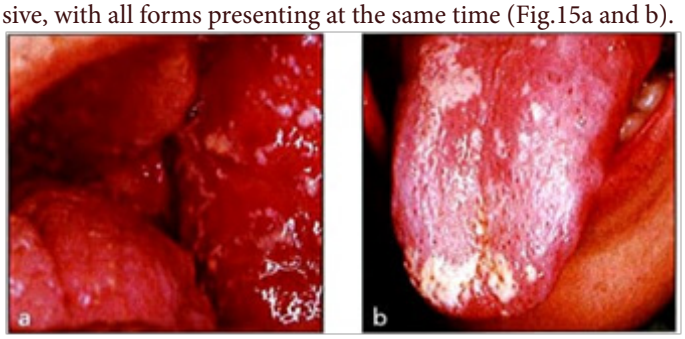


Fig. No.15 (a and b): Typical white plaques of candidiasis on oral mucosa of an immunosuppressed patient during chemotherapy.

Treatment consists of the use of local antifungal topical agents in

the milder forms and systemic treatment for severe cases. Topical medications can include amphotericin B oral suspensions. In severe cases, when the fungal infection is no longer localized to just the oral cavity, systemic fluconazole or intravenous amphotericin B can be prescribed.

C. Growth and development:

Alterations in growth and development have been reported in association withhigh-dose chemotherapy in young patients. In particular, the permanent dentition may exhibit shortened and conical roots, impaired alveolar development, incomplete enamel formation, and in some instances complete agenesis of teeth. The growth centers associated with the development of the mandible and the maxilla may also be affected, resulting in underdevelopment of these structures. The addition of radiotherapy compounds these difficulties.

Chemotherapy-induced mucositis may significantly impair the patient's nutritional and caloric intake. Further compromising the patient's nutritional status is chemotherapy-induced nausea, vomiting, diarrhoea, anorexia, enteritis, malabsorption, and impaired liver function. The diet during mucositis is tailored to the patient's ability to eat solid foods. If chewing is too painful, a liquid diet can be prescribed. Food that would take the shape of its container would be characterized as a liquid (broth, pudding, mashed potatoes, baby food). If the patient is unable to tolerate liquids, total parenteral nutrition will be prescribed.

Summary and Conclusion

The prosthodontic management of patients undergoing radiotherapy and chemotherapy plays a crucial role in mitigating the adverse effects of cancer treatment on oral health and overall well-being.

Effective prosthodontic management begins with a thorough pre-treatment assessment, including a comprehensive dental evaluation and patient education on the potential oral complications of cancer treatment. Collaborating closely with the oncology team allows for individualized treatment planning and timely interventions to prevent and manage oral complications.

During cancer treatment, prosthodontic support is essential in providing patients with the necessary tools and resources to maintain oral hygiene and alleviate symptoms such as xerostomia and mucositis. Regular follow-up appointments allow for the early detection and management of complications, ensuring the long-term success of prosthetic rehabilitation. With optimal coordination of efforts of the entire treatment team, the patient's survival and quality of life will be enhanced.

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