

Dental care before, during and after Radiotherapy in Head and Neck Cancer: Review of the Literature

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ABSTRACT

The outcome of radiotherapy must be considered thoroughly so that every effort is taken to minimize the oral complications before, during and after cancer treatment. Radiotherapy is largely used for the treatment of head and neck cancer, in conjunction with chemotherapy. The oral complications of radiotherapy result from injury to the salivary glands, taste buds, oral mucosa, alveolar bone, and skin. Acute and reversible effects seen are (mucositis, taste loss, oral infections and xerostomia) while others are chronic (xerostomia, dental caries, periodontal disease, trismus, and osteoradionecrosis). Depending on available health care the patient may rely on his local dentist for pre-treatment oral care during cancer treatment, as well as the long-term oral complications of cancer therapy. Dental treatment decisions require an understanding of the staging of the patient's cancer and prognosis for survival. In general, the dentist can help prepare the patient prior to therapy by treating any active or potential dental infection, and gives supportive care during treatment.

KEYWORDS: Dental Care, Head and Neck Cancer, Radiotherapy, Xerostomia.

INTRODUCTION

Radiotherapy is largely used for the treatment of head and neck cancer, in conjunction with chemotherapy. Majority of the Carcinomas belong to squamous cell histological variety. They are usually diagnosed at an advanced stage. Approximately two third of patients had a survival of five years. Localized tumors (Stage I and II) can be treated surgically, but advanced cancers (Stage III and IV) require radiation with or without chemotherapy as adjunctive or definitive treatment. Therefore, most patients with oral cavity cancer receive head and neck radiation therapy (RT) as part of their treatment.^{1,2}

The oral complications of radiotherapy result from injury to the salivary glands, taste buds, oral mucosa, alveolar bone, and skin. Acute and reversible effects seen are (mucositis, taste loss, oral infections and xerostomia) while others are chronic (xerostomia, dental caries, periodontal disease, trismus, and osteoradionecrosis). Patients treated with chemotherapy and RT may be at greater risk for oral mucositis and secondary oral infections such as candidiasis. The oral complications can impair quality of life. Depending on available health care the patient may rely on his local dentist for pre-treatment oral care during cancer treatment, as well as the long-term oral complications of cancer therapy.^{3,4}

ORAL MANIFESTATION OF RADIO THERAPY

Acute manifestation of radiotherapy to the Oral

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Cavity:

Taste alterations: Alteration and loss of taste usually begin with the first 200-400 cGy. After three weeks it takes 500-8,000 times normal concentrations of taste stimulant to elicit a normal taste response. Taste acuity levels will return to normal in 2-4 months after completion of radiotherapy, if adequate saliva is available.⁵

Xerostomia/salivary gland dysfunction: Salivary glands may be permanently destroyed during therapy. Saliva is reduced in volume and altered in consistency. The Reduction is dependent upon the total dose of radiation.^{6,7} In first week Flow may be reduced by 50% and further up to 100% may occur. The saliva is more mucinous. Some patients may perceive an improvement in salivary output over time.⁷

Mucositis/ulceration/pain: The mucosa exposed to the radiation becomes edematous, erythematous, and may ulcerate. Pain varies in severity and may be intensified by certain foods. The patient develops problems in swallowing. The buccal mucosa, soft palate, borders of tongue and floor of the mouth are at greater risk of mucositis. Most of the symptoms usually resolve within six weeks following completion of therapy.⁸

Infection: Candidiasis is most common secondary infection. Infections may be caused by wide spectrum of bacterial, mycotic and viral pathogens.^{8,9}

Nutritional deficiency: Difficulty in eating caused by

xerostomia, mucositis, and dysphagia may lead to nutritional deficiency and dehydration.^{7,10}

Chronic manifestation of radiotherapy to the Oral Cavity:

Salivary gland dysfunction: Salivary gland tissue is highly radiosensitive and the damage caused is nearly irreversible and damage caused is dependent on the doses of radiation. This can lead to permanent change in quality and quantity of saliva.¹¹

Radiation caries dental demineralization: The breakdown of tooth structure occur following radiation therapy. Radiation effects both major and minor salivary glands which are encompassed in the field of radiotherapy leading to change in chemical properties of saliva (more acidic) This all result in formation of carcinogenic bacteria and demineralization of teeth.¹² Decreased saliva, renders oral cavity deficient of the protective property of saliva and imbalance in phosphate ions and calcium anecessary to maintain the hydroxyapatite content of enamel and dentin.^{13,14}

Periodontal disease: Risk of attachment loss is also at stake if teeth lies within the field of high-dose radiation therapy. Poor oral hygiene, tobacco use, smoking and other systemic disease or significant salivary gland dysfunction increase periodontal disease. Serial pre and follow-up radiographs may demonstrate change in the trabecular bone and periodontal ligament space in the of previously irradiated bone.¹⁴

Trismus: Restriction of movement of temporomandibular joint along with spasm of muscles of mastication may develop within the field of radiation. Restricted mouth opening can lead to por oral hygiene, decreased dietary intake, restrict prostheses use and access for dental care and intubation in case of general anesthesia.^{7,8}

Soft tissue necrosis/Osteoradionecrosis (ORN): Soft tissue and bone may develop necrosis because tissues affected by the radiation become hypovascular, hypoxic and hypocellular. The threat of necrosis persists indefinitely, although the risk is minimal when the total dose of radiation is <5000 cGy. Increased risk for necrosis can be attributed to various factors including compromised vascularity from previous surgery, poor nutritional status, uncontrolled diabetes, and heavy tobacco or alcohol use. The necrosis process may result spontaneously or result from trauma, leading to non-healing soft tissue, bone lesions, and necrosis.¹⁵ Failed tooth extraction, invasive dental procedures, and prosthetic appliances can lead to trauma. The maxilla is much less susceptible to ORN than mandible. Non-healing bone ulcers may become infected, causing chronic pain, bad breath and prevent use of oral prostheses. These factor can be an additive factor in development of pathologic fracture.¹⁶

Developmental maxillofacial deformity: Children receiving radiation therapy on head and neck region may develop altered tooth and craniofacial development and

degree of anomaly depends on the dose of radiation therapy and the age of the child at the time of therapy.

Decreased cellularity, Fibrosis and hyalinization of blood vessels leads to decreased perfusion of tissues which worsens with time.^{14,15}

GOALS OF DENTAL MANAGEMENT

Goals of dental management of a radiotherapy patient:

1. Pre treatment goals

- Eliminate potential sources of infection;
- Counsel patient about complications of cancer therapy;
- Provide preventive care.

2. Goals during cancer therapy

- Provide supportive care for oral mucositis;
- Provide treatment of oral candidiasis;
- Manage xerostomia;
- Prevent trismus.

3. Long-term, post-treatment goals

- Manage xerostomia;
- Prevent and minimize trismus;
- Prevent and treat dental caries;
- Prevent postradiation osteonecrosis (ORN);
- Detect tumor recurrence.

Oral Assessment before Treatment: To a significant degree, the oral problems associated with radiation therapy can be prevented or minimized through optimal management. The acute effects of radiation therapy include mucositis, altered salivary gland function and mucosal infection. The long-term effects are due to changes in the vascularity and cellularity of soft tissue and bone. These changes lead to hypervascularity, hypocellularity and hypoxia of the tissues. The affected bone and soft tissue have a reduced capacity to remodel and at increased risk of infection and necrosis.^{17,18} A detailed dentist evaluation and assessment should be completed before the start of therapy. Poor oral hygiene, loose and broken teeth, altered restorations, periapical and dontal disease, are likely to precipitate complications during and after a course of radiation therapy. In addition to the clinical examination, a thorough radiographic examination is crucial to determine the presence of periapical abnormalities, periodontal status, and tumor invasion of bone. An OPG plus selective periapical or bitewing films should be available for dental assessments. Multidisciplinary team work and Consultation with the patient's physician is essential for overall risk assessment and scheduling of any required dental intervention.¹⁷

During Therapy: Monitoring of the oral cavity is essential during follow-up in order to intervene and address the condition and decrease the side effects. oral hygiene care products and protocols may decrease the incidence, magnitude, and duration of complications. Therefore patients should continue use oral hygiene

regimen protocol throughout the entire course of treatment. The patient should indulge in self-care procedures like frequent brushing with a soft-bristled toothbrush and fluoride toothpaste or gel to help prevent plaque accumulation and caries of the teeth.^{17,18}

After Therapy: After the completion of radiation therapy, acute oral complications usually begin to resolve. Patients should follow an oral health self-care regimen to keep the teeth and gums healthy. Oral exercises should be introduced to reduce the risk and severity of trismus. Additional dietary counseling sessions may be appropriate for patients to accommodate permanent changes to their oral cavity produced by surgery and radiation. Long-term follow-up of patients after radiation therapy are mandatory.^{19,20} Close monitoring and prompt management will lead to decrease in chronic complications that may occur, such as xerostomia, development of cavities, candidiasis and risk of osteoradionecrosis (ORN). The follow up period is best time for patients to deal and tackle any oral related problems. Patients with cancer are more likely to experience a recurrence and may require further therapy.^{19,20}

CONCLUSION

The outcome of radiotherapy must be considered thoroughly so that every effort is taken to minimize the oral complications before, during and after cancer treatment. Dental treatment decisions require an understanding of the staging of the patient's cancer and prognosis for survival. In general, the dentist can help prepare the patient prior to therapy by treating any active or potential dental infection, and gives supportive care during treatment.

Patient should be evaluated for periodontal and oral care and examination before the patient starts cancer therapy helping us to decrease complications associated with radiotherapy and chemotherapy. Majority of oral complications such as mucositis, candidiasis, and osteoradionecrosis, are managed by the oncology team.. Dentists should be prepared to consult with the Multidisciplinary oncology team in order to put forth the best care for the cancer patient during entire course of treatment, and for the rest of the patient's life.

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