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Oral complications of cancer treatment

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Summary
This report describes the oral complications that may occur in patients who have undergone radiotherapy of the head and neck for the treatment of cancer. It highlights modalities available for reducing and managing these treatment-related consequences. It also discusses the difficulties encountered by the dental health professional providing care for these patients.

Keywords: *Radiotherapy, radiation caries, mucositis, trismus, and treatment.*

Résumé
Ce rapport decrit les complications par voix orale qui peuvent arriver chez les patients qui ont suivi la radio-therapie de la tete et du cou pour le traitement du cancer. Il insiste sur les modalites mises sur pied pour reduire et menager ces consequences liees aux traitement. Il parle aussi des difficultes rencontrees par les chirugiens dentaires qui soccupent de ses patients.

Introduction

The head and neck region is an important anatomic site for malignant neoplasms of the head and neck. Many cases of invasive cancer will require radiotherapy as primary treatment, as palliation or as adjunct to chemotherapy or surgery.

Radiation treatment of tumors of the head and neck often involves unavoidable irradiation of the salivary glands. Unfortunately, salivary gland tissues within the field of radiation become essentially non-functional after two or three weeks of standard fractionated radiotherapy. The final loss of salivary gland functions after irradiation depends on the dose and field of radiation [2]. Once irradiated, most patients have compromised salivary functions which seldom reverses in adult treated with tumorocidal doses of radiation [3]. The reduced salivary flow causes mucositis, loss of taste, difficulty in eating and swallowing as well as radiation caries. Radiotherapy also induces fibrotic changes in the muscles within the field of radiation. This results in limitation of mouth opening.

This report discusses a patient in whom several side effects of radiotherapy were observed 4 years after undergoing radiation therapy for the treatment of carcinoma of the cavum, and highlights the effects such a treatment could have on the oral health of the patient. The paper also points out the difficulties that could be encountered by the dental practitioner in the treatment of such patients.

Case report

A 34-year-old Nigerian lady presented in the clinic complaining of dark patches on her teeth. She had noticed them two years before presentation. She decided to seek treatment for them as she felt they were getting more widespread.

Past medical history revealed that she had been diagnosed with lymphoepithelioma of the cavum four years before. She had received initial chemotherapy. Later, combined chemotherapy and radiotherapy were administered. A report of her last medical check up two months before this dental visit indicated that a systematic review showed the carcinoma was controlled and there was no evidence of recurrence. She had however developed contractures of the masseter muscles in the last one year. This responded initially to carbamezepine and diazepam. Over time however, this combination was no longer effective. Bilateral infiltration of the muscles with botulinic toxin was carried out and although it gave good results, it did not totally eradicate the contractures.

Over the previous two years, she had noticed darkening of the tips and necks of some of her teeth. They were not uncomfortable but were becoming an aesthetic problem.

Examination revealed an anxious looking and thin female patient. She carried a small bottle of water, from which she took, regular sips during the history taking and clinical examination. When questioned about this, she explained that she needed water to keep her mouth moist and comfortable when talking.

She exhibited severe trismus with maximal mouth opening of less than 1.5 cm (Fig 1).

Fig. 1 Maximal mouth opening of the patient severely restricted due to muscle trismus.

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Both masseter muscles were tense and slightly tender to palpation. The left masseter went into spasm for about twenty seconds during the examination. The patient was in pain during this period. Palpation of the submandibular, submental and cervical lymph nodes revealed nothing of significance. Intraorally, the mucosa and gingivae were red and painful in some areas. The mouth appeared dry. The mouth mirror tended to stick to the mucosa if left in contact with it for any period of time. There were two pit amalgam restorations on the buccal surface of the lower right, second molar and on the occlusal surface of the lower left first molar. They had been in place for seven years. The incisal tips of 431113 were darkened. The dark areas were generally hard in nature but they had broken down in some parts and felt soft on probing. Similar dark lesions also occurred on the cervical areas of the molars (Fig 2).

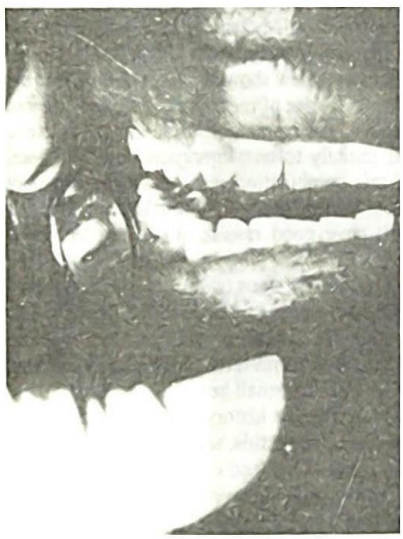

Fig. 2 Radiation caries developing at incisal tips of 3111 and circumferential caries at the cemento-enamel junction of 61.

A diagnosis of radiation mucositis and radiation caries of 6431136 was made. These as well as the masseteric spasm and trismus observed resulted from the effects of radiotherapy. The patient was educated on her oral conditions. Her participatory role in oral care was explained to her. Generalised scaling and polishing were carried out to treat the gingivitis. The warm saline mouthwashes and antibiotics prescribed resulted in the speedy resolution of the mucositis and gingivitis. The softened tooth tissues on the carious teeth were then excavated and restored. The dark areas in the anterior teeth were ground off before restoring them to improve aesthetics. Fluoride mouth rinses were prescribed to help reduce the incidence of caries. Sodium bicarbonate solution was also advised to complement cleaning of the teeth and buffer oral acids. She was placed on a regular recall programme to monitor the oral conditions and treat caries as the need arises. This was done in order to check the spread of caries particularly towards the pulp. This could result in the need for extraction and the possibility of osteoradio necrosis. During the recall visits, oral prophylaxis was also carried out to control periodontal disease and avert the possibility of extractions. The review regimen afforded the opportunity to monitor and eliminate potential dental and periodontal foci of pathosis.

Discussion

Up to 15 liters of saliva is produced every twenty-four hours by the healthy adult [4]. Saliva has several functions. Its secretion maintains oral homeostasis and lubricates the mouth and upper pharynx. It modulates oral flora and aids in the initial digestion of food. It also facilitates speech and swallowing. Saliva buffers the acid generated by carbohydrate metabolism and aids in tooth remineralization, thus protecting it from decay. The salivary glands and saliva are part of the mucosal immune system.

A patient with partial or complete absence of saliva is at risk of oral infection and tooth demineralization. Xerostomia is a serious side effect of medication [5] as well as radiotherapy in head and neck cancer. Potent inhibitors of salivation are controlled primarily via cholinergic innervation [4]. Although the salivary glands have a low rate of mitotic activity within their component cells [6] they are not radio-resistant. The glands are very sensitive to damage by radiation. The serous glands seem to be the most radiosensitive and are the first damaged. Mucous cells are destroyed late. Clinically, this is observed as production of thick viscous saliva in the first two or three weeks of radiation treatment. With time, the saliva diminishes considerably.

The effect of radiation damage is not only on the volume of saliva produced, but also on its viscosity, pH, electrolyte and immunoglobulin level. The reduced salivary volume also has an effect on the composition of the oral microflora. There is an increase in the cariogenic bacteria population at the expense of noncariogenic organisms [7,8]. This predisposes the patient to several problems including rapidly progressive dental caries and higher incidence of periodontal problems. The reduced volume of saliva also diminishes the buffering capacity of saliva. Nearly 45% reduction in buffering capacity has been recorded after irradiation of the major salivary glands [9[. This is an important factor in the development of radiation caries.

Normal saliva buffers helps to prevent a reduction in oral pH and when this does occur, it is transient thereby reducing the risk of acidic destruction of the tooth. When xerostomia develops, the buffering ability is severely compromised and oral pH is reduced more frequently and for longer periods of time leading to substantial demineralization of dental tissues and ensuing dental caries. In addition, with normal salivary flow any demineralization resulting from acid contact of enamel is rapidly reversed by continuous bathing of the tooth in the calcium-rich medium of saliva. With reduced saliva, this remineralization process is also reduced. Apart from these, xerostomia results in a net decrease of immunoglobulins.

The clinical pattern of radiation caries is unique. Tooth surfaces normally regarded as immune to carious process are affected first. This includes smooth surfaces like the incisal tips and cervical area seen in this patient. The decay is said to develop rapidly often causing great destruction in weeks. The rapid progression and destruction can involve the pulp and lead to infection of the alveolar process. This could cause osteradio necrosis. Circumferential caries can occur at the cemento-enamel junction with eventual encircling of the tooth leading to fracture at the gingival margin [10].

Other enamel areas become desiccated. Areas like the occlusal and the incisal surfaces become severely abraded exposing underlying dentine. Invasive decay then follows. The reason for radiation caries is not completely understood. Rapid decay of teeth after head and neck radiation regardless of field of treatment supports the conclusion that combined oral environmental changes are responsible [5]. This patient's carious lesions seem to have been much slower in onset because they were noticed two years after radiotherapy. This may be related to her diet that did not include frequent consumption of sucrose-rich foods which would have led to frequent reduction of oral pH and subsequent tooth

demineralization. The same reason may explain the relatively slower rate of destruction of the patient's teeth. Most of the lesions were confined to the enamel. Unlike salivary glands tissue, mucosal cells have a rapid turnover rate. They therefore have a low resistance to radiation. The stomatitis associated with radiotherapy is due to the combined effect of the radiation as well as species overgrowth of normal oral microoganisms, The mucositis compromises oral hygiene for both the patient and the dental health professional resulting in a vicious cycle. The increase in microbial population resulting from poor oral hygiene aggravates the mucositis and this in turn makes the mouth even more painful. The xerostomia worsens the irritation and breakdown of the mucosa [11]. The patient experiences pain and burning in the mouth when eating This is particularly so with spicy or rough textured foods. Bacteria and fungi are opportunistic invaders of these compromised tissues and they worsen the mucositis.

When muscles are within the field of radiation, oedema, cell destruction and fibrosis can occur. The muscle fibrosis leads to trismus and a reduction in the range of movement of the affected musculature. Fibrosis and trismus resulted in the limitation of mouth opening seen in this patient. They complicate oral hygiene procedures for the patient. Provision of dental care is also difficult as instrumentation and visibility in the oral cavity is severely handicapped. An aspect of muscle derangement which is not often reported is the contractures or spasm experienced by this patient. When the spasms occur, the patient is unable to open her mouth till the spasms resolve. This is probably due to the effect of the radiation on the innervation of the masseteric muscles.

All dental care should be directed at promoting and maintaining tissue integrity and preventing infection in the region. Tissue breakdown may lead to invasion of oral microorganisms into the blood circulation and subsequent sepsis [12, 13]. A patient undergoing radiotherapy must understand that good oral hygiene is essential in reducing the oral complications of their treatment. Normal saline and sodium bicarbonate solutions, which buffer oral acids and dissolves mucous, and microdebris are the commonly used cleaning and lubricating agents. Other exogenous lubricants and rinses include artificial saliva, oral rinses, sprays and fluorides in various forms, concentrations and delivery systems. A number of anaesthetics and mucosal coating agents to control pain have also been suggested.

Salivary stimulating agents are used when patients are still able to produce some saliva. They can be mechanical like chewing gum, gustatory like citrus containing beverages or pharmacologic like pilocarpine. Other suggestions include modifying the patient's medication schedules to counteract peak xerostomic effect with a natural increase in salivation. This is particularly helpful for patients with medication induced hyposalivation.

The patients must maintain a balanced diet as patients with severe xerostomia often avoid foods like fruits which burn unprotected mucosa. Dental management of these patients can be extremely difficult in view of the limitation or intraoral visibility and access imposed by the trismus. Muscle spasms lengthen the appointment period. Extreme care must be taken when mucositis is present and treatment cannot be postponed. A lot of time and patience must be budgeted for each appointment. Ingenuity in modifying and maneuvering dental instruments and hand pieces is an asset. The use of adhesive restorative material, which limits the use of the hand piece, is advocated for carious lesions particularly because the dry field necessary for this procedure is easily achieved in the xerostomic mouth. There is also the important advantage of continual fluoride release of the glass ionomer cements which exhibit strong anti-caries effect on the restored teeth thereby reducing the chance of recurrent caries in future.

Conclusion

As the incidence of head and neck cancer increases and the use of high-dose radiation therapy rises, the dentist will be called upon to treat a wide variety of radiation-induced oral complications. This is because acute and chronic complications of oral tissues and changes in the physiologic process frequently accompany cancer therapies. Unfortunately, prevention and treatment of such sequelae have become an often overlooked priority of the treatment team[14] Treatment planning for radiotherapy patients begins immediately after tumor diagnosis and is directed primarily towards prevention of oral complications. In the event that such complications occur, the dentist must not only be familiar with the treatment regimens available for managing these conditions but also those for preventing future deterioration in oral health. He must not be ignorant of the difficulties encountered in carrying out these dental procedures in such patients.

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