

Dental Care for Cancer Patients in the Prevention of Complications of Chemotherapy and Head and Neck Radiation Therapy

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ABSTRACT

Oncological diseases occupy one of the first places in the structure of disability and mortality of the population. The main methods of treating patients with malignant tumors in the maxillofacial area are surgical method, radiation therapy and chemotherapy. Treatment with only one of the listed methods is rarely performed, mainly at the stage of cancer in situ or stage I of the disease. The treatment depends on the clinical and morphological characteristics of the tumor and requires the use of all methods simultaneously or in a certain sequence. Radiation and chemotherapy treatments not only have systemic side effects, but also side effects in the treatment area. Against the background of antitumor treatment, there is an exacerbation of concomitant chronic diseases, including odontogenic ones. Pathological changes appear on the mucous membrane oral cavity, on the skin, in the subcutaneous tissue, in the salivary glands and in the bone marrow of the jaw bones. The degree of damage to these structures during tumor treatment depends on their initial condition. At the same time, the initial condition of the oral cavity affects the quality of antitumor treatment. Poor oral hygiene and chronic odontogenic lesions can cause the development of episodic fevers and other general complications. All this requires stopping or changes in the tactics of antitumor treatment, which reduces its radicalism. It becomes obvious that sanitation of the oral cavity, carried out before treatment by an oncologist, will avoid or reduce the frequency complications in the maxillofacial area, improve the quality of life of an oncology patient. Dental care for such a patient has features and requires an individual approach.

The purpose of this study was to review the literature on the main oral tissue complications arising from chemotherapy and radiation therapy in the head and neck region.

In Google Scholar, Medline, Scopus, Web of Sciences, PubMed a systematic review was conducted. Search keywords terms included head and neck cancer, dental care, prevention of complications of cancer, oral tissue lesions manifestation, chemotherapy, head and neck radiation therapy. Conducted a preliminary search and reviewed 132 titles and abstracts in this literary review included 48 article.

This article analyzes the main complications of oral tissues resulting from chemotherapy and radiation therapy in the head and neck area and provides practical recommendations for the management and prevention of complications in this category of patients.

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Received: February 13, 2024; **Accepted:** February 21, 2024; **Published:** February 27, 2024

Keywords: Dental Care, Prevention of Oral Complications, Head and Neck Cancer, Chemotherapy, Radiation Therapy

Introduction

Hundreds of thousands of patients annually receive anticancer chemotherapy and radiation therapy. All conditions are being created to maintain the quality of life of people who are successfully fighting this serious illness [1,2].

Cancer therapy can cause specific diseases of the oral cavity, which require special knowledge of dentists. Chemotherapy and head and neck radiation therapy can affect the entire body, including the teeth and gums. Side effects of treatment may include inflammation of the mucous membranes of the mouth (mucositis), infections, changes in taste, dry mouth, pain, tooth decay, gum

disease and mouth ulcers [3,4].

Modern dentistry solves problems in the oral cavity of patients before, during and after treatment of cancer, incl. dental problems that may accompany chemotherapy and radiation therapy. New diagnostic and treatment methods have changed the prognosis of life expectancy and quality of life [5].

Treatment of malignant tumors of the oropharyngeal region at the present stage is based on the principles of a multidisciplinary approach, which makes it possible to reduce the volume of surgical interventions, and in some cases even avoid them [6].

The results of using an integrated approach in the treatment of tumors of this localization, obtained by most authors, are more

effective than the results of isolated radiation, chemotherapy or surgical treatment methods [7].

Leading oncology clinics have sufficient experience in combined treatment of tumors of the oropharyngeal region, which makes it possible to evaluate long-term results and compare them [8].

One of the most important criteria for the effectiveness of any treatment method is the reduction in the level of negative reactions and complications [9].

Most side effects of chemotherapy and radiotherapy can be caused by toxic effects on a specific organ or disruption of the division of normal cells in the structure of the affected organ [10].

Complications in the oral cavity **radiation therapy** include, dental caries, periodontitis, mucositis, fibrosis, oropharyngeal candidiasis, oral infection (viral, fungal, bacterial), salivary gland hypofunction and xerostomia, neurosensory disorders (mucosal pain and taste dysfunction), fibrosis of the masseter muscles (masseter, temporalis, medial and lateral pterygoid muscles) which can lead to trismus, temporomandibular disease [11-24].

Osteoradionecrosis can develop at any time after radiation therapy. Radiation damage differs from changes caused by chemotherapy in that when irradiated tissues undergo irreversible damage, which puts the patient at risk of developing complications in the oral cavity [25-29].

Prevention of osteonecrosis and its complications largely depends on high-quality dental preparation patient before therapy, timely diagnosis of osteonecrosis, individual approach to the provision of dental care [30,31].

Depending on the length of time after radiation and chemotherapy, local damage is divided into early and late. Early damage develops during radiation therapy or in the next 3 months after it (the deadline for recovery of sublethal cell damage). Late injuries are considered to be those that developed after the specified period, more often after several years.

Late chemoradiation damage is based on violations of more radioresistant structures, which are a consequence of the gradual accumulation of changes in small blood and lymphatic vessels, causing disruption of microcirculation and the development of hypoxia of irradiated tissues, which can subsequently cause fibrosis and sclerosis [32,33].

All of these complications have a symptom of mutual aggravation, i.e. may complicate each other during complex antitumor therapy. All developed complications require dental correction. Dental care for such patients is provided immediately after discharge from an oncological institution; then, during the first year, a dental examination must be carried out every 3 months, which will be combined with oncological monitoring. After the first year, a dental examination is performed every 3-6 months, depending on individual factors: level of hygiene, degree of development of xerostomia, and the presence of restorative orthopedic structures.

Prevention and Therapeutic Treatment before Starting Antitumor Therapy

All patients with neoplastic lesions receiving chemotherapy should undergo a thorough dental evaluation, which includes a clinical examination and radiographic examination [34].

Before starting any manipulations aimed at treating cancer, a preliminary diagnosis of the condition of the oral cavity is recommended in order to:

- Prevent further development of diseases that may worsen during cancer therapy;
 - Obtain data on the initial state of the oral cavity, which will later be used in monitoring and analyzing the effect of radio- and chemotherapy;
 - Identify metastases in a timely manner;
- minimize the level of discomfort in the patient's oral cavity during antitumor therapy.

All patients with neoplastic lesions receiving chemotherapy should undergo a thorough dental evaluation, which includes a clinical examination and radiographic examination. Before starting chemotherapy, the patient should be instructed and properly motivated to practice oral hygiene.

In the case of chemotherapy for the head and neck area, the following recommendations must be taken into account:

- periodontally or structurally compromised teeth must be removed;
- teeth associated with maxillofacial abscesses also need to be removed or treated through endodontic intervention;
- all surgical procedures must be completed in at least 10-12 days;
- it is advisable to fully carry out the necessary dental treatment aimed at restoring teeth affected by caries or pathological abrasion, replacing defective restorations, removing poorly fixed orthopedic structures and orthodontic arches;

existing dentures should be thoroughly cleaned and treated daily with nystatin to prevent the development of fungal infections.

Surgical sanitation of the oral cavity before oncological treatment has its own characteristics and problems and should be as gentle as possible, taking into account strict indications and knowledge of the upcoming treatment methods [35].

The optimal time interval between surgical procedures in the oral cavity and the start of chemoradiotherapy is 10–14 days, since at this time the risk of complications is minimal [36].

If surgical dental sanitation was not carried out in the maxillofacial area before radiation therapy, the optimal option for sanitation can be considered the period when the total dose of radiation therapy does not exceed 20 Gray.

Oral Care During Chemotherapy

From the very beginning of chemotherapy, special attention should be paid to proper oral hygiene in order to minimize the risk of developing possible complications.

There are generally accepted protocols for the prevention and treatment of chemotherapy-induced mucositis.

Rinsing the Cavity with Rinses

Given the increased likelihood of oral infection during chemotherapy and increased bleeding of soft tissues, patients are advised to brush their teeth 2-3 times a day. Patients who undergo general radiation or chemotherapy are also likely to develop thrombocytopenia.

The dental surgeon must be aware of the number of leukocytes and platelets in the blood of a patient undergoing chemotherapy or radiotherapy before starting treatment. If the platelet count is

above 50, 000 units/mm³, the patient can undergo most routine dental procedures, however, if the platelet count is below this figure, it is imperative to consult an oncologist [37,38].

If invasive dental procedures are necessary, blood or platelet concentrate transfusions should be considered. If the platelet count is less than 2000 units/mm³, it is recommended to prescribe antibiotic prophylaxis and consult with doctor. The installation of dental implants can be carried out one and a half years after radiation therapy, taking into account the condition of the oral tissues, the level of their vascularization and the possible prognosis of healing.

Prevention is the best treatment for soft tissue bleeding in the oral cavity. When the platelet count is low (eg, < 20, 000 units/mm³), even routine tooth brushing can cause bleeding. Oral hygiene in such cases should be carried out with a disposable sterile sponge under slight pressure or a cotton swab, followed by rinsing with a solution of chlorhexidine 0.6%.

Caring for Patients after Chemotherapy

Oral care should include daily brushing of teeth with soft brushes. Chlorhexidine rinses should be continued to prevent the development of infectious lesions. Consultations regarding dietary modification are useful in a program to prevent the development of caries induced by the xerostomia effect. For candidiasis of the mucous membrane, antifungal drugs should be used.

Protocols to reduce the risk of developing osteoradionecrosis include adequate choice of endodontic treatment instead of tooth extraction, use of non-lidocaine local anesthetics without or with very low concentrations of epinephrine, prophylactic antibiotics, as well as their use after surgery for two weeks, use of hyperbaric oxygenation before starting invasive procedures [39].

In the early stages of necrosis, conservative treatment is indicated. The exposed bone can be irrigated with saline or an antibiotic solution, and patients should be instructed to irrigate the affected area. When a bone sequester forms, it should be removed immediately to ensure the epithelialization process [40,41].

Patients who underwent radiation therapy in the maxillofacial area, require lifelong dental support. This is caused by the presence of irreversible changes in the mucous membrane of the oral cavity, salivary glands, jaw bones, in the hard tissues of teeth [42,46].

The role of the dentist in the professional practice and care of patients before, during and after radiotherapy, as well as the role of interprofessional professionals in improving the condition of patients, is very important in relation to subsequent **chemotherapy and head and neck radiation therapy**.

Acknowledgments

Conflicts of interest statement: All the authors declare no conflicts of interest.

Funding: No funding.

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