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Special features of oral care in cancer patients

Oral infections should be treated before the onset of cancer treatment but extensive dental operations are usually not needed. Chemotherapy can cause neutropenia and thrombocytopenia. Blood counts are at their lowest 7–10 days after treatment and the risk of infection is at its highest. The duration of low blood-cell counts depends on the intensity of the treatment given. The blood counts of patients must always be checked before any dental procedures. Prior to invasive procedures, the hospital unit treating the cancer patient should be contacted for consultation about appropriate timing of the procedure and whether the patient's medication should be modified. The oral wound should be healed before cancer treatment is continued.

During an ongoing course of cancer treatment, invasive procedures should be performed only when absolutely necessary. Elective procedures should be scheduled either before or after treatment. If invasive dental operations are needed during chemotherapy prophylactic antibiotics are usually needed to prevent severe infections.

Regular care of oral health is crucial after radiotherapy for the head and neck cancer. Before the onset of radiotherapy patients are given guidance concerning preventive care and risk factors as part of specialised care. However, individual treatment plan is implemented within primary health care. Reasons for specialised consultations include tooth extractions following radiotherapy, uncontrolled caries progression and infections, problems associated with soft tissue or osteonecrosis as well as problems with prosthetic rehabilitation.

Författare

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In the Nordic countries 130 000 new patients with cancer are diagnosed annually. Currently the number of cancer survivors in Nordic countries is about 1 000 000 (1). The length of the risk period is dependent on the type of cancer, treatment modalities used and need of radiotherapy in head and neck cancer. The risk of complications during oncological treatment for cancer is reduced by elimination of oral infection foci. After treatment some patients have increased risk for dental complications for several years. This group includes patients with head and neck radiotherapy as well as allogeneic stem cell transplantations. However, in most patients with cancer dental operations can be done normally after cancer treatment period.

For head and neck cancer the most important curative regimens are surgery and radiotherapy. The majority of patients diagnosed with head and neck cancer are cured after primary cancer care. The outcome of treatment may be improved by chemotherapy administered during radiotherapy. Compared to radiotherapy alone, chemoradiotherapy increases the overall survival of patients with head and-neck-cancer by as much as 22 % (2). In the case of advanced cancer, chemotherapy and other pharmaceutical treatments are used to prevent spread of disease, to alleviate symptoms caused by the disease and to prolong the life of the patient.

Main points

- Oral infections should be treated before the onset of cancer treatment.
- Patient's underlying diseases and the treatments planned for cancer define the extent of dental operations needed before the onset of oncological therapy.
- The treatment plan for suspicious teeth is determined by the duration of oncological treatments and the degree and duration of immune deficiency.
- Regular care of oral health is crucial after radiotherapy for the head and neck cancer.

In haematological malignancies and lymphomas, chemotherapy is the first line of treatment and intensive therapy (autologous or allogeneic stem cell transplantation) is used for selected patients. This involves high-dose chemotherapy (or combination of chemotherapy and radiotherapy) and stem cell infusion either from themselves (autologous) or their siblings/voluntary register donors (allogenic).

Chemotherapy and the mouth

Chemotherapy suppresses the function of bone marrow, which increases the risk of opportunistic infections e.g. from oral cavity. When planning elimination of oral infection foci, the depth and duration of neutropenia and the increased risk of infection must be taken into consideration. Significant infections must be addressed before the onset of oncological treatment. In the case of more intensive treatments, such as intensive therapy and stem cell transplantation, the oral status is determined in specialised dental care. However, in most patients with cancer, the oral status can be determined by their own dentists.

Patient's underlying diseases and the treatments planned for cancer define the extent of dental care needed before the onset of oncological therapy. Generally, apical periodontitis, furcal lesions, pericoronitis of a partially erupted tooth and gingival pockets of more than 6 mm can be regarded as infectious foci. Poor root fillings and deep caries lesions are regarded as relative foci of infection. Eradication of infectious foci is based on careful clinical and radiological examination. Asymptomatic cyst or some other intraosseal lesion can be diagnosed by radiological examination. Intraosseal lesions should be eliminated before the start of oncological treatments. The treatment plan for suspicious teeth is determined by the duration of oncological treatments and the degree and duration of immune deficiency. Stem cell transplants, especially allogeneic, demand more critical approach.

The urgency of the onset of oncological treatments is determined by the physician. If immediate onset of treatment is necessary due to the malignancy such as acute leukaemia, oral foci of infection can be addressed between courses of treatment. Dental procedures should be scheduled just before the onset of a new chemotherapy cycle. To minimise the risk of infection and bleeding, neutrophil levels should be increasing (and above 0.8) and thrombocyte levels sufficiently high (above 40). Root canal treatment and restorative caries treatment can be performed during ongoing chemotherapy. If sufficient supportive treatment is provided, tooth extractions can also be safely performed, even during more intensive treatment (3).

Prophylactic antimicrobial medication should cover common oral strepococci and anaerobic bacteria. The primary antimicrobial drug for prevention of infection of dental origin is oral amoxicillin 2 g, which may be combined with metronidazole 400 mg in patients with increased risk of infection. High risk patients are given prophylactic treatment with intravenous antimicrobials. Antimicrobial medication used for neutropenia-induced infection is often sufficient for oral and maxillofacial procedure prophylaxis. According to a retrospective cohort study, as many as 34 % of the microbes that cause sepsis during stem cell transplantation are of oral origin (4).

Clinical relevance box

Chemotherapy can cause neutropenia and thrombocytopenia. Blood counts are at their lowest 7–10 days after treatment; when the risk of infection is highest. The duration of low blood cell counts depends on the intensity of the treatment. Prior to invasive procedures, the hospital unit treating the cancer patient should be contacted for consultation about appropriate timing of the procedure and whether the patient's medication should be modified. The oral wound, e.g. after tooth extraction, should be healed before cancer treatment is continued.

Before the onset of radiotherapy for head and neck region, patients are given guidance on preventive care and risk factors as part of specialised care, however, individual treatment plan is implemented within primary care. Reasons for specialised consultations include tooth extractions following radiotherapy, uncontrolled caries progression and infections, problems associated with soft tissue or osteoradionecrosis as well as problems with prosthetic rehabilitation.

Treatment-induced oral mucositis

Mild oral symptoms are common during chemotherapy, but severe mucositis is rare. Clinically significant oral mucositis was observed in only 6 % of patients receiving chemotherapy; however, mucosal problems are significantly increased by smoking (12 % of patients)

Table 1. *Intensity and timing of dental operations during different oncological treatments.*

Oncological treatment	Infection risk	Restoration of foci of infection(based on clinical and radiological examination)	Dental procedures(thrombocyte and leukocyte counts must be assessed)
Chemotherapy	Moderate during course of treatment	Acute infections must be eliminated	Prior to or in between courses of treatment
Autologous stem cell transplantation	Considerable	Exact localisation and restoration of foci	Prior to treatment
Allogeneic stem-cell transplantation	Considerable, continues for months	Exact localisation and restoration of foci (more long-term immune deficiency must be taken into consideration)	Prior to treatment

Table 2. *Side effects of radiotherapy of the head and neck*

Side effect	To be considered in outpatient care*
Mucositis	Pain, problems with prosthesis use, fungal infections
Hyposalivation	Caries formation, fungal infections, problems with swallowing and speech
Destruction of taste nerves	Changes in diet, caries formation
Fibrosis	Difficulties opening the mouth
Periodontal ligament damage	Risk of infection/osteoradionecrosis
Microvascular changes	Risk of osteoradionecrosis

* Norwegian: poliklinisk virksomhet

(5). The incidence of mucositis is clearly higher in patients with more than a year since their last dental check-up before diagnosis (11.2 % vs. 3.0 %).

More recent biological anti-cancer drugs are also associated with symptoms of the oral mucosa; for example, sunitinib, used for treating renal carcinoma, causes mucositis in one in five patients. The use of sorafenib is also associated with stomatitis and symptoms of dry mouth.

The conditioning regimen, especially if it includes total body irradiation, preceding stem-cell transplantation, almost invariably causes severe damage to the oral mucosa, often accompanied by mucositis. The incidence of severe mucositis is significantly reduced (63 % vs. 98 %) and its duration shortened (6 vs. 9 days) by palifermin, a keratinocyte growth factor (6). Palifermin increases the thickness of the oral mucosa (in 72 % of patients) and alters taste sensation. The oral mucosa of patients receiving palifermin resembles soft, wet cardboard.

In more than half of all patients oral fungal infections are detected during oncological treatments (7). Oral fungal infections can often be treated locally. If local treatment is not efficient enough, fluconazole is a good alternative. Fluconazole solution, which is gargled and swallowed, results in high local concentrations, but swallowed capsules also have a good effect. If needed, the drug can also be administered intravenously.

As many as half of the patients with long-term neutropenia have oral infections caused by the herpes simplex virus. Herpes simplex infection is also very common during chemoradiation for head and neck cancer (43.2 %). Suspicion of viral aetiology should arise especially if the patient has ulcers in the oral mucosa (8). A herpes sample should be taken from suspect areas, but treatment should be started without delay based on the clinical picture.

Drug-associated osteonecrosis

Bisphosphonates, used to prevent fractures in patients with malignancies, cause osteonecrosis of the jaw. It occurs most commonly in multiple myeloma patients (8.5 %), being less common in patients with breast cancer or prostate cancer (3.1 % and 4.9 %) (9). Tooth extraction increases the risk of osteonecrosis significantly, whereas smoking, periodontitis or endodontic treatment does not. Monoclonal antibody denosumab used for prevention of skeletal-related events in patients with bone metastasis or prevention of treatment induced bone loss is also associated with the risk of osteonecrosis (10).

Radiotherapy and the mouth

The dental treatment of patients receiving radiotherapy for the head and neck cancer is divided between primary and specialised health care. The state of oral health of these patients is usually determined at the oral disease units of central hospitals. In addition to planning dental restoration, the need for radiation protection is assessed and a preventive treatment programme is drawn up. Obturators and other devices may be needed to complement surgical treatment. The extent of radical dental operations prior to radiotherapy is influenced by the type of malignancy, the volume of the tumour and the possible tissue grafts. The decision on teeth extractions are influenced by anatomical form, tissue grafts and loss of continuity of the mandible. The extent of cancer surgery also affects mouth opening, which has an effect on the patient's possibility to maintain oral hygiene. The risk of side effects, such as risk of osteoradionecrosis and decreased function of salivary glands, depends on the dose of radiation, treatment volume, fractionation and possible use of chemotherapy in combination with radiotherapy (11).

Teeth with extensive caries damage, periodontitis or poor prognosis due to other reasons (misalignment, cleaning problems, deficient root filling) must be removed. The risk of caries formation and oral fungal infections is significantly increased by decreased salivation, changes in microbial flora, development of mucositis and problems opening the mouth. Regular preventive and maintenance dental care is therefore crucial after radiotherapy. Before the onset of radiotherapy the patient is given guidance on preventive care and on risk factors in specialised medical care, while prophylaxis programmes for individual patients are drawn up as part of primary care. Dental check-ups should be scheduled every 3 months on an outpatient basis during the first year.

Osteoradionecrosis is a severe adverse effect seen after radiotherapy targeting oral cavity. The changes induced by radiotherapy lead to impaired bone regeneration; at worst, even minor traumas may result in exposure of hypoxic, hypovascular and hypocellular bone. The ulcer caused by osteoradionecrosis is open to the bone and with conventional treatment will not heal within 6 months (12). Osteoradionecrosis is seen even in 5–7 % of patients treated with radiotherapy (13). The risk of osteoradionecrosis can be reduced by modern radiotherapy techniques. The risk increases, in particular, when the radiation dose exceeds 60 Gy (gray) and the treatment volume includes the mandible. In half of the patients, osteoradionecrosis is preceded by tooth extraction. Dental care before and after radiotherapy should be systematic and efficient so that tooth extractions can be avoided. If extractions are necessary in areas of high radiation (> 60 Gy), supportive treatment, such as antimicrobials and hyperbaric oxygen therapy, should be considered (12).

Xerostomia caused by radiotherapy can be prevented efficiently

with new techniques that enable minimisation of the radiation dose to the parotid gland. If the dose received by one of the parotid glands is below 20 Gy, or that received by both glands less than 25 Gy, the risk of severe xerostomia is small (14).

Oral mucositis is present in all patients during radiotherapy of oral cavity and in some patients it may become chronic. When the radiation dose exceeds 50 Gy, these symptoms are in most cases severe, with frequent ulceration. Eating may become very difficult and a percutaneous endoscopic gastrostomy (PEG) tube insertion is a good option to ensure adequate nutrition during therapy. Patients suffering from mucositis usually require quite strong pain medication.

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