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Dental management of the childhood cancer patient

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Abstract

Introduction: More than 40,000 children undergo cancer treatment each year. In the long term, children and adolescents are at risk of developing oral complications over time, especially in relation to teeth.

Objective: To analyze the literature about dental management of patients with childhood cancer, including oral examination before treatment, preventive strategies, dental treatments and oral complications related to cancer therapy.

Methodology: The PubMed database was used; review and research articles were identified where oral and dental complications in pediatric patients diagnosed with cancer were mentioned. The terms "cancer", "childhood", "dental", "complications" were used.

Results: The oral examination before a treatment indicates that thanks to the help of an examination prior to starting any treatment, the severity of oral complications can be reduced. Preventive strategies indicate that the pediatric dentist should be involved with the patient from the diagnosis, developing oral care plans that are individualized for each patient. Dental treatments must be performed after evaluating the child's tolerance to avoid any complications. Oral complications related to cancer therapy such as mucositis, xerostomia, and infections must be anticipated during cancer treatment.

Conclusion: As pediatric dentists we need to participate at the beginning of treatment at the time of cancer diagnosis, developing prevention plans and oral care related to the patient's needs. Support from the oncology team is needed to provide optimal treatments.

Keywords: cancer, childhood, dental, complications

1. Introduction

Approximately 200,000 new cases of childhood cancer are diagnosed annually worldwide [1]. It is estimated that approximately 15,000 children (hereafter defined as ages 0-14 years) and adolescents (hereafter defined as ages 15-19 years) are diagnosed with cancer in the U.S. each year [2]. More than 40,000 children undergo cancer treatment each year [3].

In the long term, children and adolescents may be at risk for developing oral complications over time, especially in relation to their teeth, as cancer treatments are performed during the most active stage of organ development [4]. From a dental perspective, the pediatric patient undergoing cancer treatment may present with pre-existing untreated dental caries, periodontal disease and/or pathologic lesions of oral hard and soft tissues; have oral manifestations of cancer; develop oral complications as a result of anticancer therapies; and develop long-term dental and orofacial complications after completion of anticancer therapies [5]. In addition, chemotherapy and/or radiation therapy for cancer treatment can cause many acute and long-term side effects in the oral cavity [6]. Rationale: Poor oral health can complicate the quality of life of patients suffering from this disease. Preventing and treating pre-existing oral diseases is essential to minimize complications in these patients.

2. Objective: To analyze the literature on the dental management of patients with childhood cancer including oral examination before treatment, preventive strategies, dental treatments and oral complications related to cancer therapy.

3. Methodology

Articles on the subject published through the PubMed, SCOPUS and Google Scholar databases were analyzed, with emphasis on the last 5 years. The quality of the articles was evaluated using PRISMA guidelines, i.e., identification, review, choice and inclusion. The quality of the reviews was assessed using the measurement tool for evaluating systematic reviews (AMSTAR-2). The search was performed using Boolean logical operators AND, OR and NOT. It was realized with the words "cancer", "childhood", "dental", "complications". The keywords were used individually, as well as each of them related to each other.

4. Results

4.1 Oral screening prior to treatment

The aim of this stage is to identify existing oral pathologies prior to oncologic therapy, to treat them and thus avoid complications of oncologic treatment, or at least reduce their severity [7]. In 1989, the National Institutes of Health first recommended that all cancer patients undergo an oral examination prior to treatment to diagnose, prevent, and stabilize or treat any oral problems that could compromise cancer care [8]. Early evaluation can identify oral complications of cancer treatment, and oral health intervention can reduce the severity of oral soft tissue disorders, mucositis, and/or fungal infections [9]. Identification of signs and symptoms of oral lesions can act as a warning sign of serious, occult systemic involvement [10]. The presence of a dental surgeon working directly on the medical team is essential for the prevention and treatment of oral manifestations resulting from antineoplastic treatment [11]. All patients should be protocolized to ensure that they present optimal oral conditions before initiating treatment with radiotherapy to minimize local and systemic complications during and after treatment and to establish the measures that can be taken to reduce adverse effects [12]. The key to success in maintaining a healthy oral cavity during cancer therapy is patient compliance [13]. Each patient should be treated on an individual basis; consultations should be sought with the patient's physicians and, when appropriate, with other dental specialists prior to instituting dental care [14].

In conclusion, with the help of a pre-treatment examination, it will facilitate the establishment of a dentist-patient relationship before any oral cancer-related complications begin. However, it is important to perform an early evaluation in order to perform an intervention that can reduce the severity of oral complications.

4.2 Preventive strategies

Early childhood caries (ECC) is one of the most prevalent diseases in children worldwide [15]. Patients who develop caries may be more susceptible to certain species associated with oral disease or have fewer potentially protective oral species [16]. Due to radiation, caries progresses rapidly, and the damage is severe, primarily manifesting as destruction of the tooth enamel surface, cratering beneath the surface, and exposure of the underlying dentin, forming an extensive porous structure [17]. Oral care modalities usually include removal of dental plaque by professional mechanical tooth cleaning methods and gentle removal of mucosal debris with a moist sponge to keep the oral cavity as clean as possible [18]. A soft toothbrush and fluoride toothpaste or gel should be recommended to prevent plaque buildup and demineralization of the teeth [19]. Ultrasonic brushing and flossing should be allowed only if the patient is properly trained [20]. If moderate

to severe mucositis develops and the patient cannot tolerate a normal soft nylon toothbrush or a brush with tufts on the ends, foam brushes or super-soft brushes soaked in chlorhexidine can be used [21]. Periodic dental check-up and protective measures, at least twice a year, are essential and should be performed both during and after oncologic therapy in pediatric patients [22]. For patients at increased risk, it will be necessary to visit the dental clinic at least every six months (or more frequently if problems such as oral mucositis, xerostomia or trismus are present) [23]. Dentists should discuss the importance of a healthy diet to maintain nutritional status with emphasis on foods that do not promote caries [24].

In conclusion, the pediatric dentist should be involved with the cancer patient from diagnosis and participate in treatment by developing preventive oral care strategies that are individualized for each patient to ensure a better quality of life.

4.3 Dental Treatments

If a child who is about to begin cancer therapy requires dental procedures such as restorative treatment, periodontal therapy, or extractions, the pediatric dentist and oncology team should discuss the patient's anticipated tolerance for dental treatment [2]. Devices with metallic components should be removed in children requiring multiple magnetic resonance imaging (MRI) of the head and neck region (such as children with intracranial tumors) to avoid scatter and artifacts on MRI [25]. Some key medical considerations for the safe delivery of dental treatment (restorative treatment, periodontal therapy, and extractions) are absolute neutrophil count (ANC), platelet count, and coagulopathies secondary to cancer or treatment [26]. Patients should receive a thorough oral evaluation, including a complete periodontal examination, radiographic examination, functional evaluation of the salivary glands, and measurement of jaw range of motion [27]. When performing procedures in immunocompromised individuals, complete blood counts and differentials may be appropriate to determine if antibiotics should be prescribed adjunctively or if platelet transfusions are required prior to any invasive oral treatment [28].

Gingivitis is assessed by gingival erythema and bleeding on probing in the absence of bone loss. However, it may be affected by hematologic status. For example, the gums may appear pale in cases of anemia, while they may appear erythematous in the thrombocytopenic patient [29]. With regard to dental restorations, the use of composite resins, resin-modified glass ionomer cements, and amalgam restorations is suggested compared to glass ionomer cements alone because of the requirement for frequent replacements due to the breakdown of margin integrity [30]. Surgical procedures should be as atraumatic as possible, with no sharp bony edges and satisfactory wound closure [31]. To minimize the risk of development of osteonecrosis, osteoradionecrosis or bisphosphonate-related osteonecrosis of the jaw (BRONJ), patients who will receive radiation to the jaws or bisphosphonate treatment as part of cancer therapy should complete all oral surgical procedures before these measures are applied [32].

In conclusion, treatment of dental caries, periodontal problems and oral pathologies should be performed before initiating cancer therapy. It is important to assess the child's tolerance before starting any dental treatment to avoid any complications.

4.4 Oral Complications Related to Cancer Therapy

Antineoplastic therapy can have adverse effects on the oral health of a cancer patient, which in turn can profoundly affect the patient's overall well-being. Oral mucositis, xerostomia, and opportunistic infections are more common in pediatric patients^[33]. Acute oral complications arise 5-7 days after the start of each cycle, corresponding to a drop in blood counts^[5].

4.4.1 Oral mucositis: oral mucositis is defined as an inflammation and ulceration of the oral mucosa^[34]. Oral mucositis is likely to develop in 40% of children receiving standard-dose chemotherapy, 80% of patients receiving radiation therapy for head and neck cancers, and 75% of patients undergoing bone marrow transplantation^[35]. In recent years, several studies have shown that the use of low energy laser was particularly interesting in the prevention and treatment of radiation-induced or chemically induced mucositis^[36]. Also, maintaining good oral hygiene is important in preventing and reducing the severity of oral mucositis^[37].

4.4.2 Xerostomia: Xerostomia is defined as the "subjective sensation of dry mouth characterized by a marked decrease and/or thickening of saliva"^[38]. However, there is a radiotherapy dose threshold below which damage to the relevant salivary glands can be reduced, if not prevented. In recent years, clinically validated dose constraints have been established for saliva-associated organs at risk (parotid glands, submandibular glands, and oral cavity)^[39]. Importantly, saliva-stimulating medications are not approved for use in children^[31].

4.4.3 Oral infections: Children receiving anticancer therapy easily develop opportunistic oral infections (fungal, bacterial, and viral)^[40]. When oral candidiasis is diagnosed in children receiving anticancer therapy, nystatin is the first line of medication to try, although it may not always resolve the infection. Systemic antifungal agents such as amphotericin B may be necessary^[41].

In conclusion, oral complications such as mucositis, xerostomia and infections should be anticipated during cancer treatment. It is important to know which treatments should be applied in these situations to avoid aggravation of the oral health of the patient undergoing cancer treatment.

5. Conclusion

As pediatric dentists we have to participate from the beginning of the treatment at the moment the diagnosis of cancer is made. This is in order to be able to elaborate a prevention and oral care plan according to the patient's needs. The treatment of dental caries, periodontal problems and oral pathologies should be done before starting cancer therapy. Treatment-related oral complications can be treated in a patient-centered manner. However, the support of the oncology team is needed to provide the appropriate treatment for the patient and improve the patient's quality of life.

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