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Orthodontics in Head and Neck Cancer Patients: A Literature Review

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ABSTRACT

Introduction: Although head and neck cancer is associated with pain, disfiguration, dysfunction, psychosocial distress, and death, recent advances in treatment have brought improvements in outcomes. These advances include minimally invasive surgery, organ-sparing surgical procedures, precision radiotherapy with IMRT (Intensity Modulated Radiotherapy) and VMAT (Volumetric Modulated Radiotherapy), immune check-points inhibitors, and curative multimodal approaches. This is the reason why orthodontists are more and more consulted for adult and pediatric patients who have completed a successful therapy against head and neck cancer.

Literature review: This review focuses on considerations to be followed when planning orthodontic treatment for long-term survivors after a head and neck cancer. The limited number of publications for this topic agrees that cancer process for each patient has to be adequately assessed and the essential aim of the orthodontic treatment has to be modified to obtain the general health and the well-being of the patient.

Conclusion: Orthodontics must face different approaches in cancer patients cured. Orthodontic treatment has not to be started before 2 years after completion of the cancer therapy, the mechanics of the orthodontic treatment should be as simple as possible, they must minimize the risk of root absorption and to apply a low force application.

Keywords: Orthodontics, Head and neck neoplasms/radiotherapy, Cancer survivors, Tongue/radiation effects

Abbreviations: IMRT: Intensity Modulated Radiotherapy; VMAT: Volumetric Modulated Radiotherapy; HPV: Human Papillomavirus; TMD: Temporomandibular Joint Disorders; RT: Radiation Therapy; EGFR: Epidermic Growth Factor Receptor

INTRODUCTION

Head and neck cancers are defined as malignant tumors located in the upper aerodigestive tract. They represent 5% of adult cancer cases in Spain. The upper aerodigestive tractincludesnasopharynx, paranasal sinuses, oropharynx, hypopharynx, larynx, oral cavity [1-3].

The most important risk factor are tobacco and alcohol use, but human papillomavirus (HPV)and Epstein-Barr virus infection, is a key etiological factor in oropharynx cancer, which is rising worldwide. Head and neck malignancies requires a multidisciplinary approach, with surgery, radiotherapy, and systemic therapy serving as key components of the treatment of locally advanced disease [1-3].

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Considerations in the pediatric cancer patients are different from adults. The major cause of death among children worldwide is cancer. The total number of childhood cancers constitutes approximately 2-3% of all cancers [3]. Growing patients treated with chemotherapy and radiotherapy can present side effects of oncological treatment: cranial growth disorders, size reduction of the alveolar processes of maxilla and mandible, temporomandibular joint disorders (TMD), inhibition of tooth development and microdontia, hypodontia, oligodontia and anodontia. We also detect demineralization of the hard tissues of the teeth, shortening of dental roots, and premature closing of root canal apices, root resorption, and tooth mobility [3].

A cancer survivor (Adult and pediatric patients) refers to any individual who had been diagnosed with cancer and remains in complete remission for the rest of his life (at least disease free for five years and without any form of therapy for two years).

Since there is increase in survival rate, the need for orthodontic treatment is also increasing. As a result, orthodontist consults more patients who have successfully undergone therapy against cancer [4].

LITERATURE REVIEW

The paper aims are reviewing the possibilities of orthodontics therapy for pediatric and adult cancer survivors. The data base of this review is Scopus and PubMed, and the key words were orthodontics, head and neck cancer, irradiation, and radiotherapy. The papers reviewed were from 2000 to 2022.

Mitus-Kenig [4] in 2015 recommends the following principles for pediatric and adult cancer survivors:

1. Orthodontic treatment should not be started earlier than 2 years after completing oncological treatment.
2. The treatment plan must be adjusted to the general state of the patient.
3. The mechanics of the treatment should be as simple as possible, using low forces and reducing the risk of tooth root resorption.
4. The recommendation is to use aesthetic brackets instead of metal ones, and the use of possibly clear-aligners in selected cases.
5. It is suggested to limit the treatment to treating the upper dental arch due to shorter pubertal growth and inhibited growth of the mandible. The treatment of class II cases is extremely difficult and modifying the growth may prove impossible.
6. Patients should be particularly motivated to maintain ideal dental hygiene because due to a reduced saliva flow, they are more prone to caries.
7. It is recommended to eliminate elastics and prescribe fluoride products and mouth moisturizers.

Dental extractions in irradiated bone (the mandible), may lead to osteoradionecrosis. For that reason, teeth with periodontal involvement, retained root tips, or partly erupted teeth should be extracted prior to starting radiation therapy (RT). Communication between dental and Medical and radiation Oncologists is essential so that necessary treatment is provided at the correct time in coordination with medical care [5,6]. A complete head, neck, oral and dental assessment is recommended as the standard of care and should be conducted as soon as possible after the cancer diagnosis and prior to any oncological treatment.

Radiotherapy is administered in 2 Gy per fraction, 5 days per week to a total of 65 to 70 Gy. Sensitizing agents usually consist of a platinum agent (cisplatin or carboplatin) or an EGFR inhibitor (cetuximab) is used concomitantly with radiotherapy. The role of immune checkpoint inhibitors is more and more important in selected patients. Additionally, the patient's general condition undergoes significant changes due to the immune-modifying, neurotoxic, emetogenic, and other toxic effects of therapy. For these reasons, and due to oral mucositis, dental treatment is generally contraindicated during and immediately after active drug and radiotherapy cancer therapy [6]. Rough and irregular dental surfaces must be eliminated also to reduce soft tissue irritation and trauma [7-9].Other morbidity symptoms appear with radiotherapy in patients undergoing head and neck radiation. One of the most common is taste loss. A long follow-up pilot study of the degree of taste loss in these patients for the four basic tastes (sweet, salty, bitter and sour) and umami, as their evolution over time have been published and the authors have demonstrated a decrease on the taste perception on the sweet, bitter, salty, acid and umami tastes during the first six weeks. Symptoms recover at one year from the beginning of radiotherapy [10]. In the publication of Seremidi [11], they performed a systematic review of the prevalence of dental defects and correlates clinical findings with specific characteristics of each treatment modality. After data extraction of the data base search the prevalence of crown and root defects was assessed after radiation therapy and chemotherapy. Correlations between each defect and the type of anticancer treatment were performed. In summary sixteen nonrandomized studies were included, yielding a total of 1300 patients, and root defects were more common than crown defects. The most common root defect was impaired root growth and microdontia the most common crown defect. Radiotherapy dose and age field were statistically associated with higher prevalence of dental defects. Mishra [6] studied the possibilities of orthodontic therapy for pediatric cancer survivors. She advocates understanding the fundamental disease, the treatment protocols, the effects on growing skeleton, dental development, oral cavity and oral mucosa, dental caries, bone, and orthodontic tooth movement.

Göran Dahllof and Jan Huggare [7] in a 2004 publication thinks that strategies used by orthodontists in treating long survivor's pediatric patients may include using appliances that minimize the risk of root resorption, low force application, accepting a compromised treatment result by simplistic mechanics and terminating the treatment earlier than normal, and not treating the lower jaw. They recommend postponing the start of orthodontic treatment at least 2 years after completion of cancer therapy.

Johal [12] Introduces the term of self-esteem that is used to describe a person's overall sense of self-worth or personal value. Self-esteem can involve a variety of beliefs about the self, such as the appraisal of one's own appearance, beliefs, emotions, and behaviors. Johal considers that undergoing fixed orthodontic therapy appeared to have a more negative impact on the overall Dental Health Related Quality of Life during the first 3 months of treatment, which then improved to pre-treatment scores. In contrast, a significant improvement was detected in self-esteem. Patient-reported outcomes, together with clinical indicators, can provide a more comprehensive assessment of the patient's oral health. The Oral and Dental Health-Related Quality of Life has been defined as a multidimensional concept which includes a subjective evaluation of oral health, functional well-being and satisfaction with care. Some publications are investigating the use of questionnaires of Dental Quality of life in patients (pediatric and adults) treated for head and neck cancer [13-16].

Mitus-Kenig [5] published in 2020 a study using a questionnaire to compare the quality of life of 40 cancer survivors with a control group of healthy subjects before, during, and after the orthodontic treatment. Their conclusion is that the outcome of orthodontic treatment in cancer survivors did not differ from the healthy orthodontic patients. The orthodontic treatment had an impact on the oral health quality of life both in the cancer and the control groups with a significantly higher impact in male cancer survivor patients.

CONCLUSION

Since there is increase in survival rate for patients (Pediatrics and adults), the need for orthodontic treatment is also increasing. Strategies used by orthodontists in treating long survivor's pediatric and adult patients may include using appliances that minimize the risk of root resorption, low force application, simple mechanics and terminating the treatment earlier than normal, and not treating the jaw. Finally, the start of orthodontic treatment must be at least 2 years after completion of cancer therapy.

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