



Review

Pre-Radiation dental considerations and management for head and neck cancer patients



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ABSTRACT

Treatment of head and neck cancer (HNC) is accompanied by a high rate of morbidity, and complications can have a lifelong, profound impact on both patients and caregivers. Radiation-related injury to the hard and soft tissue of the head and neck can significantly decrease patients' quality of life. The purpose of this study is to provide patient-specific guidelines for managing the oral health and related side effects of HNC patients treated with radiation therapy.

Based on reviewed articles retrieved on the PubMed database, guidelines for management of the oral health of this patient population were organized into three separate categories: cancer, patient, and dentition. The location, type, and staging of the cancer, along with the radiation used to treat the cancer significantly impact dental treatment. Several unique patient characteristics such as motivation, presence of support system, socio-economic status, nutrition, and race have all been found to affect outcomes. Dental disease and available supportive dental management was found to significantly impact treatment and quality of life in this patient population.

By comprehensively assessing unique cancer, patient, and dental-related factors, this review provides individualized evidence-based guidelines on the proper management of this complex and vulnerable patient population.

Introduction

In 2016, there were over 48,000 new cases of head and neck cancer (HNC) resulting in over 9,500 deaths in the United States alone [1]. Approximately 90% of HNC are squamous cell carcinomas [2]. It is widely known that major risk factors such as smoking, alcohol, and use of smokeless tobacco products are associated with head and neck squamous cell carcinoma (HNSCC) [3,4]. HNSCC has been known to have a high incidence of lymph node metastasis, with over two-thirds of patients presenting with regional lymph node involvement, and 10%

presenting with distant metastases [5,6]. Strong emphasis must be placed on early detection of these cancers, as the 5-year survival rate drops from 83% to 37% when the diagnosis is made at an advanced stage rather than at an early, localized stage [6].

Over 80% of HNC patients endure acute oral complications as a result of the effects of radiation [7,8]. Radiation-related injuries to the hard and soft tissues of the head and neck significantly decrease patients' quality of life. Treatment-related complications include xerostomia, oral mucositis, trismus, dental caries, periodontal disease, infection, odynophagia and osteoradionecrosis (ORN). These side effects

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can have dramatic implications on the ability to perform everyday functions such as talking, chewing, tasting, and swallowing, resulting in decreased caloric intake and difficulty in maintaining weight [8].

Few protocols have been developed for the dental management of head and neck cancer patients. The purpose of this article is to provide a novel approach to patient-specific, rather than standardized guidelines for dentally managing HNC patients prior to undergoing radiation therapy. In order to individualize the guidelines for each case, three separate factors must be considered: the cancer, the patient, and the dentition.

Methodology

A systematic literature search was conducted via PubMed online database for articles published between 1975 and 2017. The goals of this search were to identify articles that can be used to provide evidence to develop pre-radiation dental guidelines in HNC patients treated with radiation therapy (RT) alone or combined treatment modalities.

Results

Articles were reviewed as a result of the literature search. The cancer types evaluated included the following: lip cancer, oral cavity cancer, nasopharyngeal cancer, oropharyngeal cancer, hypopharyngeal cancer, laryngeal cancer, and salivary gland cancer. Relevant studies regarding patient- and tooth-related factors and their relation to radiation therapy of the head and neck, survival, or comorbidities were also evaluated. The findings of the literature review found to affect patient outcomes were divided into three major categories (cancer factors, patient factors, and dental factors) and evidence-based guidelines were developed and summarized below.

Cancer factors

Staging

Staging of HNC pertains to the analysis of tumor size (T), lymph node involvement (N) and presence of metastases (M). A specific TNM classification system exists for each HNC dependent on location. These three characteristics describing the cancer are collectively analyzed to provide a specific cancer stage [5,6]. Cancer staging is considered the most crucial aspect in determining disease prognosis as well as treatment options. Clear associations have been found between advanced stage cancer and poorer survival, independent of race, ethnicity, or financial status [6,9,10].

Staging per specific location has important implications in assembling an effective treatment plan that optimizes survival and minimizes complication rates. The National Comprehensive Cancer Network (NCCN) has assembled specific recommendations and algorithms regarding surgical treatment for HNC based on cancer site and stage. The presence of positive margins or new nodal involvement requires re-evaluation of cancer stage and alteration in treatment regimens [11]. All of this information is crucial to the dental provider in tailoring their individualized oral health treatment plan.

HPV p16/18 status

HPV (particularly the HPV-16/18 genotype) has emerged as a major risk factor in the development of oropharyngeal cancers, with some studies attributing over 60% of US cases to be HPV-associated [12,13]. HPV-positive HNC incidence has been on the rise and has been determined to be associated with a younger, white, male population with increased number of sexual partners [2]. Several studies have shown that HPV-positive HNC tends to have a more favorable prognosis than HPV-negative HNC. While the average 5-year survival rate for HNC has been reported to be 63%, studies have reported 5-year survival rates in

HPV-positive HNC patients to be as high as 89% [14,15]. If there is clinical suspicion when evaluating or excising a lesion in a patient, then HPV staining is crucial. Careful communication must be made with the pathologist to ensure that appropriate HPV staining is done when sending the tissue for histology. Common stains include HPV 6/11, 16/18, and 31/33.

Lip cancer

Initial treatment for early stage lip cancer (T1-2 primary tumors without nodal involvement) most commonly involves primary surgical resection. Stage I-II lip cancers can most often be treated surgically without need for adjuvant RT [16,17]. Primary radiotherapy with either brachytherapy or electron beam therapy is an alternative primary treatment approach for patients who refuse surgery or in those patients in whom functional or cosmetic outcomes after surgery are expected to be poor [11]. More advanced stage lip carcinomas (Stage III-IV) are generally managed with primary surgical resection and adjuvant RT ± chemotherapy.[11] In such cases, radiation doses to the maxillary or mandibular teeth can be substantial and dental evaluation is critical.

Oral cavity cancer

The group of oral cavity cancers includes the anterior tongue, buccal mucosa, floor of mouth, alveolar ridge, retromolar trigone, and hard palate. Patients with early stage oral cavity cancers are encouraged to have primary resection (with or without ipsilateral, or bilateral neck dissection). Some reports have demonstrated improved survival with elective neck dissection, however it remains debatable amongst HNC professionals [11,18–20]. Patients with advanced stage oral cavity cancer will also have primary resection, and then dose-dependent chemotherapy/RT based on the extent of nodal disease, perineural invasion, among other adverse pathologic features [11]. There are a substantial number of patients who are either medically or technically inoperable in this disease, or patients who may refuse surgical care due to morbidity. Those patients typically receive definitive chemoradiation and the gross disease is often treated to 70 Gy. These are the highest risk cases for oral/dental complications.

Cases more amenable to surgical resection may have adjuvant radiation levels closer to 44–66 Gy [11]. In cases with planned RT, the level of dental intervention should be based upon the patient's planned radiation dosage and affected sites. The affected sites can be coordinated with the radiation oncologist by reviewing the radiation simulation mapping.

Nasopharyngeal cancer

Nasopharyngeal cancers have the highest likelihood of metastasis among the HNCs, and most cases (83%) are diagnosed at a regional or distant stage [11]. Early stage nasopharyngeal cancer has similar survival rates as other HNCs detected at an early stage. However, a 5-year survival rate of 37% is observed for stage IV nasopharyngeal cancer [1]. They also pose a high risk for local recurrences, and locally advanced disease following definitive therapy. Early stage (T1, N0, M0) tumors can be treated with definitive RT alone of 66–70 Gy [11]. More advanced staging have treatment plans that vary with different regimens of RT and chemotherapy. The maxilla will be at higher exposure levels than the mandible, which from a dental standpoint is more favorable given that the maxilla has a decreased comparable incidence of ORN. Depending on the severity, palliative dental care may be more prudent.

Oropharyngeal cancer

Cancer of the oropharynx includes the base of tongue, tonsils, soft palate, and posterior pharyngeal wall. This area is also rich in

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