



Review

Evidence supporting pre-radiation elimination of oral foci of infection in head and neck cancer patients to prevent oral sequelae. A systematic review



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SUMMARY

Pre-radiation dental screening of head-neck cancer patients aims to identify and eliminate oral foci of infection to prevent post-radiation oral problems. The evidence for the efficacy of dental screening is unclear. In this systematic review, we analyzed available evidence on the efficacy of pre-radiation elimination of oral foci of infection in preventing oral sequelae.

A search was conducted (MEDLINE/EMBASE) for papers published up to May 2014. Papers on head-neck cancer patients subjected to pre-radiation dental screening, (chemo)radiation and oral follow-up were included.

Of the 1770 identified papers, 20 studies fulfilled the inclusion criteria of which 17 were retrospective. A great heterogeneity in patient groups, dental screening techniques, definitions of oral foci of infection and techniques for eliminating foci was found. Most papers lacked essential details on how dental screening was performed and a clear definition of an oral focus of infection. The evidence for efficacy of elimination of oral foci of infection to prevent post-radiotherapy oral sequelae was inconclusive.

Consequently, the efficacy of pre-radiation elimination of oral foci of infection remains unclear. No conclusions can be drawn about a definition of an oral focus of infection and whether pre-radiation elimination of these foci should be mandatory.

We therefore suggest prospective studies with well-defined criteria for oral foci of infection, a clear description of which foci were eliminated and how, a detailed description of pre-radiation dental screening, clearly described patient and tumor characteristics, and a detailed dental history and dental status. Subsequently, oral problems that occur post-radiation should be systematically recorded.

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Introduction

Radiotherapy is an effective treatment option for a wide variety of head and neck neoplasms. Unfortunately, it causes acute and long term adverse oral effects. While some adverse effects are unavoidable, others, in particular the risk of developing jaw osteoradionecrosis (ORN), are thought to be reduced by a thorough pre-radiation dental screening to detect oral foci of infection [1,2]. In this review we have operationalized the concept of oral focus of infection as a pathologic process in the oral cavity that does not

cause major problems in healthy individuals, but may lead to severe local or systemic inflammation under certain circumstances [3,4]. A pre-radiation dental screening aims to locate and eliminate oral foci of infection, such as caries profunda, periodontal attachment loss, periapical problems and partially or completely impacted teeth [3–5], thus prevent radiation-related oral complications. Little evidence exists on the efficacy of elimination of oral foci of infection to prevent post-radiotherapy oral sequelae [5,6]. Nevertheless, pre-radiation dental screening of patients is daily practice in head and neck cancer centers [7,8]. Head and neck oncology patients are known to have poor dental status compared to healthy subjects [9–12]. The poorer dental status is thought to be related to the more frequent alcohol and tobacco abuse and lower dental awareness in these patients.

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Prevention of jaw osteonecrosis associated with radiotherapy, known as osteoradionecrosis (ORN), a feared late complication of radiotherapy, is probably the main reason that dental teams all over the world perform a pre-radiation dental screening of patients [3]. Despite the extensive literature on this topic, the mechanisms underlying ORN are not well understood. One risk factor for ORN, identified in the systematic review by Nabil et al. [3], is post-irradiation extraction of the mandibular tooth within the radiation field. Consequently, post-irradiation extractions should be avoided as much as possible, and pre-radiation screening for oral foci of infection is necessary. Other risk factors for developing ORN are tumor characteristics [13,14], total radiation dose [14–16], bacterial infections [17,18], dental status [19], periodontitis [12], and surgical interventions [20].

In this systematic review we analyzed the available evidence for the efficacy of pre-radiation elimination of oral foci of infection in head and neck cancer patients to prevent post-radiotherapy oral sequelae. We focused specifically on the following questions: Is pre-radiation elimination of oral foci of infection in head and neck cancer patients efficient and should pre-radiation elimination of these oral foci be mandatory?

Materials and methods

Search strategy

A broad literature search was conducted in MEDLINE/PubMed and EMBASE for papers published up to May 2014 (Supplementary Table 1). No language filters were applied. Meta-analysis, systematic reviews, randomized controlled trials, clinical studies and cohort studies were considered as sources for evidence to answer the research question.

Review strategy

After the search was conducted, duplicates were removed and the remaining papers were subjected to title and abstract analysis by 2 reviewers (JMS, MAS) independently. Title and abstract were included for full text analysis if the terms ‘head and neck cancer’ and ‘(chemo)radiation’ or synonyms were present, combined with mention of pre-radiation oral or dental care, oral or dental screening, or pre-radiation extraction, or oral status or synonyms. Single case reports, opinion papers, narrative or expert reviews, surveys, and letters to the editor were excluded, as were papers about pre-adult patients (<18 years), chemotherapy as a single treatment, surgery as a single treatment, effects of radiation on tooth structures, mucositis, and microbiology. The papers selected after title and abstract analysis were classified by study type.

The selected studies were included for full text analysis if head and neck cancer patients received external beam radiotherapy, a pre-radiation dental screening had been performed, criteria for oral foci were described (what was considered an oral focus) and patients were assessed for oral sequelae at least once after radiation (Supplementary Table 2). Two reviewers (JMS, MAS) independently analyzed the studies for the inclusion criteria and extracted data if the study was included, using a self-developed evaluation form (Supplementary Table 2). Disagreements about including or excluding studies or about extracted data were resolved after discussion. In case of insufficient information in the manuscripts for adequate assessment, the corresponding authors were contacted for more details.

Results

The search resulted in 1770 papers, 540 hits in PubMed and 1230 hits in EMBASE (Fig. 1). After removing duplicates, 1469

papers remained for title and abstract analysis. Out of the 234 papers eligible for full text analysis, 205 papers (63%) were available in full text on the internet and after contacting international library databases. Of these 205 papers, 124 papers (60%) were guidelines, protocols and descriptive papers that did not investigate or analyze effects of dental screening on prevention of oral sequelae, so they were excluded. The remaining 81 papers were subjected to full text analysis using the evaluation form (Supplementary Table 2). No randomized controlled trials were found.

In 3 out of 81 papers, an oral focus of infection was not clearly defined. The authors of these studies were contacted for more details [9,21,22]. One author [9] did not respond and one author [21] could not provide more details. These papers were excluded. Niewald et al. [22] did provide more details on their definition of oral foci of infection.

The included papers

After full text analysis, 20 studies met the inclusion criteria (Table 1). Three papers were prospective [23–25], the others were retrospective [2,12,22,26–39]. References of the 20 included studies were checked to find any additional relevant studies. None were found.

Study characteristics

The number of patients in the included studies ranged from 28 [25] to 1140 [32] (Table 1). Duration of follow-up ranged from 6 [25,27] to 60 months [29]. Five studies did not describe the duration of follow-up [26,31,33,38,39]. Tumor location was well described in most studies (Table 1). Some studies included a great variety of tumor locations in the head and neck region. Although these were not always specified in the article, most studies included other tumor sites as well, such as unknown primary tumors, non-Hodgkin lymphoma and Hodgkin lymphoma [2,23,25,27–29,31,34,35,37,39]. Two studies [33,38] included only nasopharynx carcinoma patients. Some studies also included edentulous patients in their study population.

Pre-radiation dental screening

Most papers lacked details on how dental screening was performed (Table 2), but commonly, radiographic examination ($n = 14$) and periodontal probing ($n = 19$) were performed.

Oral foci of infection

The descriptions of oral foci of infection in the papers varied greatly: we found 7 definitions for periodontitis, 4 for caries, 2 for pulpal pathology and 5 for radiographic findings (Table 3). Four of the studies provided a very precise description of what was assumed to be a focus of infection, such as “caries in which excavation may lead to pulpal exposure” [12,26,34,35], but other studies lacked adequate detail in the descriptions. They used more general terms such as “active moderate periodontal disease” [37] or “advanced/severe periodontal disease” without defining the severity of periodontitis [22–24,26–32,34–38].

Nine studies reported on the findings of the dental screening [12,24,25,28,30,31,34–36] (Table 1). In six studies [12,24,30,31,34,36] the percentage of patients presenting with oral foci was described, ranging from 20% [30] to 79% [31]. Detailed information on the type of oral foci of infection found was provided in 6 studies [12,24,25,28,34,35] (Table 1).

Generally, more recent studies reported on the presence of periodontal disease as focus of infection at pre-radiation screening, whereas in most of the older studies the periodontal condition of

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