



# Major outcomes of dental implants in oncological patients: a concise systematic review

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## Abstract

**Introduction:** The etiology of oral cancer is multifactorial resulting from several factors that predispose to the development of this pathology. The rehabilitation of oral functions after jaw surgery in patients with oral cancer is a goal that is often difficult to achieve. Dental implants offer a mechanism to provide stability to prostheses. **Objective:** This study aimed to present the main outcomes of dental implants in cancer patients. **Methods:** The systematic review rules of the PRISMA Platform were followed. The search was carried out from February to May 2023 in the Scopus, PubMed, Science Direct, Scielo, and Google Scholar databases, using articles from 2013 to 2023. The quality of the studies was based on the GRADE instrument and the risk of bias was analyzed according to the Cochrane instrument. **Results and Conclusion:** A total of 118 articles were found, 34 articles were evaluated in full and 14 were included and developed in this systematic review study. Considering the Cochrane tool for risk of bias, the overall assessment resulted in 32 studies with a high risk of bias and 32 studies that did not meet GRADE. It was concluded that implants inserted into irradiated bone showed significantly lower survival. Head and neck radiotherapy has always been considered a risk factor for rehabilitation with dental implants. However, recent data suggest that the overall 5-year implant survival in irradiated patients may be greater than 90%.

**Keywords:** Dental implants. Oncological patients. Radiotherapy. Bone grafts.

## Introduction

The etiology of oral cancer is multifactorial resulting from several factors that predispose to the development of this pathology [1]. Oral cancer has a high incidence and mortality and is among the 10 (ten) most common pathologies in the world, Brazil today represents alarming public health [1,2].

The areas that suffer most from the disease are the tongue, specifically the posterior lateral border, buccal floor, gum, mucosa, tonsils, retromolar region, tongue dorsum, soft palate, and hard palate [1]. Early diagnosis in early stages survival rate ranges from 53% to 68% whereas the diagnosis of advanced cancer is approximately 41% and 27% and in the late stage it is sadly pitifully 70 to 80% [2].

Also, histologically the most common type (94% to 96% of cases) of oral cancer is squamous cell carcinoma or squamous cell carcinoma that affects the most common sites of this pathology are the tongue (26%) and the lower lip (23% ) [2,3]. Studies indicate that smoking is the major predisposing factor for head and neck neoplasms. Most tumors are diagnosed late reducing the patient's chance of survival due to the unpreparedness of the professional and the lack of information for the population, including carcinomas and oropharyngeal [3].

Besides, oral cancer has been divided into categories such as salivary gland tumors, epithelial tumors, mesenchymal tumors, bone tumors, hematologic tumors, odontogenic tumors, and others [3]. High oral cancer mortality, prevention, and early diagnosis are undoubtedly the most effective measures

to improve prognosis, particularly if focused on disease risk factors. The dental surgeon is the health professional who has an important role in the actions and a strategic role in which the mouth is where most of these percussive lesions manifest [4].

In this context, rehabilitation of oral functions after jaw surgery in patients with oral cancer is a goal that is often difficult to achieve. Removable dentures supported by remaining teeth or gums are often unstable and rarely satisfactory. On the other hand, endosseous (dental) implants offer a mechanism to provide stability to prostheses [5,6].

In this sense, it is important to consider the quality of life of patients with oral cancer after treatment. The main objective is tumor removal, however, with a gradual increase in survival rates, postoperative rehabilitation is becoming more and more important. Recent advances in computed tomography (CT) and the use of stereolithographic models can help in the rehabilitation of patients with oral cancer [7].

Therefore, this study aimed to present the main outcomes of dental implants in cancer patients.

## Methods

### Study Design

The systematic review rules of the PRISMA Platform were followed. Available at: [www.prisma-statement.org/](http://www.prisma-statement.org/). Accessed: 03/24/2023.

### Research Strategy, Quality of Studies and Risk of Bias

The search strategies for this systematic review were based on the keywords (MeSH Terms): *Dental implants. Oncological patients. Radiotherapy. Bone grafts*. The research was carried out from February to May 2023 in Scopus, PubMed, Science Direct, Scielo, and Google Scholar databases. In addition, a combination of keywords with the Booleans "OR", "AND" and the operator "NOT" were used to target scientific articles of interest. The quality of the studies was based on the GRADE instrument and the risk of bias was analyzed according to the Cochrane instrument.

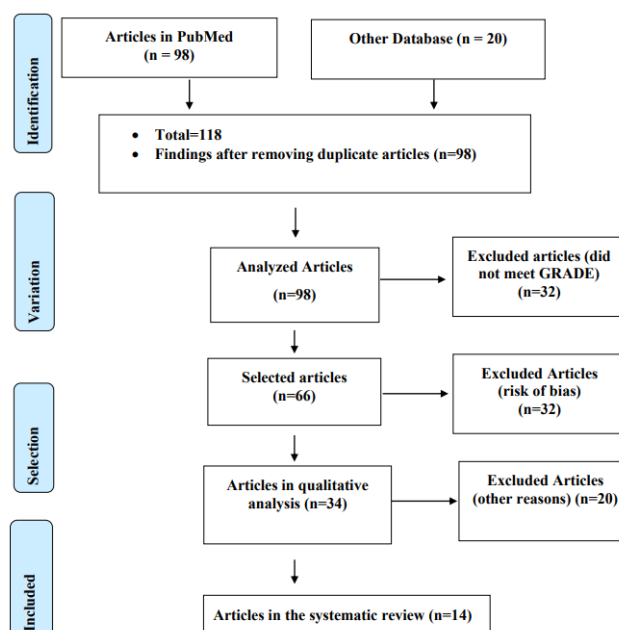
## Results and Discussion

### Summary of Findings

A total of 118 articles were found. Initially, duplication of articles was excluded. After this process, the abstracts were evaluated and a new exclusion was performed, removing the articles that did not include the theme of this article, resulting in 98 articles. A total of 34 articles were evaluated in full and 14 were included and developed in this systematic review study (Figure 1). Considering the Cochrane tool for risk of

bias, the overall assessment resulted in 32 studies with a high risk of bias and 32 studies that did not meet GRADE.

**Figure 1.** Flowchart - Article Selection Process.



Source: Own authorship.

### Major Outcomes

A retrospective clinical study highlighted the long-term clinical results of dental implants in patients with oral cancer. In addition, the analysis of the influence of radiotherapy, implant insertion time, and procedures to increase implant survival was performed. A total of 711 dental implants in 164 patients with oral cancer were included. Cumulative 5- and 10-year implant survival rates for all included implants were 87.3% and 80.0%. Implants placed shortly after ablative surgery (primary implant placement) and implants placed after completion of oncologic treatment (secondary implant placement) showed comparable implant survival (92.5% vs. 89.5%;  $p = 0.635$ ). Radiation therapy had no significant influence on implant survival of secondary implants placed ( $p = 0.929$ ). However, concerning implant site (native bone versus augmented bone) and radiotherapy (non-irradiated versus irradiated bone), implants inserted into the irradiated bone that received augmentation procedures showed statistically significantly lower implant survival ( $p < 0.001$ ) [8].

Also, a study looked at the results of dental implants in patients who previously received them for head and neck malignancies. We reviewed 90 dental implants in 27 patients who received radiotherapy for head and neck cancer and subsequently received dental implants. The cumulative implant survival rate (CISR)

was calculated. CISR at 3 years was 79.6%. Mean radiation dose at the implant site (Dmean) has been identified as an independent prognostic factor for implant survival. No implant failed if Dmean was less than 38 Gy. Regarding implant quality, dental implants in grafted bone and Dmean were independent risk factors [9].

In addition, we evaluated the clinical outcomes of dental implants (DIs) in patients with head and neck cancer (HNC) treated with radiotherapy (RT), chemotherapy alone, or bone modifying agents (BMAs). A total of 20 systematic reviews were included in the qualitative analysis. Most scored as having a high Risk of Bias (n = 11). Placement of primary DIs in the mandible of HNC patients undergoing RT doses <50 Gy was associated with better survival rates. DI placements can be considered safe in patients with HNC in alveolar bone sites who have received RT ( $\leq 5000$  Gy); however, no conclusions can be made in patients with cancer treated by chemotherapy or BMAs [10].

The neoplasms may be benign or malignant, it is up to the dentist the correct diagnosis by excisional biopsy for a small lesion with a safety margin and the incisional for a large lesion that removes from healthy tissue and also from diseased tissue [3]. Odontogenic tumors (OT) are rare, exclusive lesions of the jaws, derived from epithelial and/or ectomesenchymal elements of the tooth formation apparatus. Its biological behavior is heterogeneous, including hamartomatous tissue proliferation, non-aggressive and aggressive benign neoplasms, and metastatic malignant tumors [4].

One study reviewed 376 cases of odontogenic tumors from an oral pathology service on age, gender, anatomical site, and histological diagnosis. Keratocystic odontogenic tumors (31.6%) were the most common, followed by ameloblastoma (28.5%) and odontoma (22.6%). The average age was 32.2 years, and more than half of the patients (52.1%) were in the second and third decades of life. The male/female ratio was 1: 1.37, with a jaw/jaw ratio of 1: 2.08. The variation in the relative frequency of tumors observed between the various series, including the present study, is probably due in part to cultural differences between geographic areas, but also to the study design [6]. In this context, preventive programs can and should be implemented in public health, compared to the expense of treatment, the cost is lower and reaches a large number of people, highlighting the extreme need for the dental surgeon in diagnosis, prevention campaigns, and information to the laity [11-13].

Considering the high possibility of the dentist consulting a patient with oral complications of oral cancer chemotherapy and/or radiotherapy due to advances in this area, another study analyzed 2,700

articles and found, 2,371 were selected after the removal of duplicates and elected 40. Full-text articles. Of these, only 06 articles were included in the systematic review excluding others, as they obtained a score  $\geq 7$  with high methodological quality for the synthesis of oral complications management. Since 05 articles were associated with a low risk of bias, composing protocols suggestive of management and meta-analysis in odds ratio (0.916) to cure and relative risk (1.049) for the development of oral mucositis and pain. Suggestive protocols for treatment of oral mucositis and pain with MuGard - mucoadhesive hydrogel; PerioAid Treatment® antiseptic mouthwash with chlorhexidine and cetylpyridinium chloride; Episil® plus benzydamine - bioadhesive oromucous gel; 0.03% Triclosan Colgate Plax mouthwash; and the low-level Diode Laser is safe for cancer patients applied according to the adopted clinical parameters [7].

Finally, a meta-analysis study compared implant survival in irradiated and nonirradiated bone and investigated potential risk factors for implant therapy in patients with oral cancer. A mean overall implant survival of 87.8% (34%-100%) was found. There was a significantly higher rate of implant failure in irradiated compared to non-irradiated bone ( $p < 0.00001$ , OR 1.97, CI: 1.63, 2.37). The studies also showed that implants placed in irradiated grafted bone were more likely to fail than those in irradiated native bone ( $p < 0.0001$ , OR 2.26, CI: 1.50, 3.40). Although overall implant survival was high, radiotherapy proved to be a significant risk factor for implant loss [14].

## Conclusion

It was concluded that implants inserted into irradiated bone showed significantly lower survival. Head and neck radiotherapy has always been considered a risk factor for rehabilitation with dental implants. However, recent data suggest that the overall 5-year implant survival in irradiated patients may be greater than 90%.

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Not applicable.

## Informed consent

Not applicable.

## Data sharing statement

No additional data are available.

## Conflict of interest

The authors declare no conflict of interest.

## Similarity check

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