

## Oral Rehabilitation Following Head and Neck Cancer Treatment – Review of literature

Falcao B<sup>1</sup>, Januzzi E<sup>2</sup> and Santos F<sup>3</sup>

<sup>1</sup>Post Graduate Courses of Implantology at Ciodonto Faculty, Belo Horizonte, Brazil

<sup>2</sup>Post-Graduation Courses in Orofacial Pain/TMJ, Implantology at Ciodonto Faculty, Belo Horizonte, Brazil

<sup>3</sup>Clinical Director of Clecio Prosthodontics Belo Horizonte, Brazil

**Corresponding author:** Falco B, Assistant in the Post Graduate Courses of Implantology at Ciodonto Faculty, Belo Horizonte, Brazil, Tel: 13526430579; E-mail: [bibianafalcao@gmail.com](mailto:bibianafalcao@gmail.com)

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### Abstract

The oral rehabilitation in head and neck cancer patients is a challenge for the physician in charge of the case because a variety of functions can be affected, such as speech, deglutition, management of oral secretions and mastication. Considering the patient will be forever change after surgery, the main goal of oral rehabilitation is to restore the patient's oral functions following surgery. The side effects of the various treatments that head and neck cancer patients undergo are enormous, including xerostomia, mucositis, dysgeusia, dental hypersensitivity, fungal infections, ulceration, gingival bleeding, trismus, pain, reduced salivary flow and inability to use removable prosthesis. All of these side effects must be accounted throughout the process of oral rehabilitation because all of them will have an influence in the success or failure of the rehabilitation of the patient.

The strategy and techniques for the rehabilitation of head and neck cancer patients are directly related to the type of cancer, the extent, invasive vs. non-invasive, lymph nodes and metastasis involved, type of surgery and radiation modalities used.

**Keywords:** Cancer; Oral rehabilitation; Chemotherapy; Surgery; Radiotherapy; Surgery; Implants; Prosthodontics

### Introduction

Every year we have 390.000 new cases worldwide of head and neck cancer (HNC), it is the 11th malignant tumor most frequent worldwide, and represents 5% of all malignant tumors in the world [1]. The HNC affects mostly men (ratio men/women 2-5:1, depending on also the location of the tumor) [2]. The prognosis of these patients is always dependent on the localization and size of the primary tumor, with the involvement of lymph nodes and age [3-5]. The survival rate in 5 years less than 50% with favorability in women [3,4,6]. Unfortunately the new forms of treatments have not affected the rate of survival in the last 40 years [7].

Close to 43,250 Americans will be diagnosed with oral or pharyngeal cancer this year. It will cause over 8,000 deaths, killing roughly one person per hour, twenty-four hours per day. Of those 43,250 newly diagnosed individuals, only slightly more than half will survive beyond 5 years. (Approximately 57%) This is a number which has not significantly improved in decades [8].

HNC is a mutilating disease because the patient undergoes a physical transformation in terms of function, emotional and social adaptation. All of these factors combined will have a negative impact on the patient's quality of life [9-11].

### Materials and Methods

A literature review article using data bases such as: Medline, PubMed (1996-2013), Control trial records Cochrane (2012), Embase (1980-2013) and LILACS (1982-2013) was utilized with a strategy to identify the maximum of studies in each base. The search terms used were: head and neck cancer, dental implants, oral rehabilitation, osteonecrosis, radiotherapy, chemotherapy and surgery. The objective of this article is to produce an updated literature review for the oral rehabilitation in patients with HNC.

### Discussion

After a HNC patient undergoes surgery and other treatments such as radiotherapy and chemotherapy can be initiated oral rehabilitation. Prior to rehabilitation, it is very important to understand all that is involved in HNC. The most important thing is to give back same quality of life to this patient by doing good oral rehabilitation. This can be done by helping the patient retain some of the functions such as speech and chewing lost post-operatively.

Removal of extensive segments of the tongue, floor of mouth, mandible, and hard and soft palate as well as the regional lymphatic's usually mandates extensive rehabilitative management [12,13].

Current rehabilitative practice is centered on five principles: 1. The process of rehabilitation begins at the time of initial diagnosis and treatment planning. 2. The dentition should be preserved if possible. 3. Rehabilitative treatment plans should be based on fundamental principles of prosthodontics including a philosophy of preventive dentistry and conservative restorative dentistry. 4. Surgery before

prosthetic rehabilitation may be indicated to improve the existing anatomic configuration after ablative cancer surgery, reconstructive surgery, and/or radiation therapy. 5. Multidisciplinary cancer care is required to achieve the optimal function [14,15].

The need to treat tumors expediently often delays planning for rehabilitation. However, without a highly interactive and dynamic dialogue among health care providers during the initial treatment planning process, efforts to provide optimal rehabilitative care are impaired [15].

Among the rehabilitation there are some factors that can affect the cancer surgical treatment plan, such as: a) Prognosis and systemic status of the patient; b) Potential size and site of defect; c) Adjunctive therapy (e.g., chemotherapy or radiation) that may compromise the surgical result; d) Anticipated changes to function and cosmetics based on the cancer surgery and the availability, accessibility, and cost of rehabilitative procedures [12].

Since the 1960's, the oral rehabilitation is in constant evolution with the introduction of new techniques, biomaterials with the biggest achievement in dentistry being Osseointegrated implants to replace teeth lost, and also to support prosthesis in patients with major defects after the cancer surgery [5,6].

Bränemark et al. have pioneered the modern-day use of this technology, in which implant materials capable of bearing forces produced during normal function interface both structurally and functionally with bone [16]. Dental implants are now being used in both oral and extra oral settings and have significantly improved the restoration of both form and function to the oral and craniofacial region [17].

The characteristics of successful Osseointegration include: 1. Biocompatible implant materials; 2. Non-traumatic, aseptic surgical procedures; 3. An initial healing period in which functional loading of forces is deferred; and 4. Stress-reducing prosthodontics procedures [17,18].

Osseointegration in the maxillary-resected patient and implant-retained facial prostheses have become acceptable in major cancer centers worldwide [19,20]. Physicians should always do a good psychical evaluation of the patient in order to decide the best oral rehabilitation approach for each patient. This includes what type of tissue and bone will be available to function after the tumor has been removed, which type of prosthodontics are indicated for this patient, including the use of implants, fixed prosthesis over implants, removable implant-supported prosthesis, etc. [21,22].

There are several studies that have been done regarding oral rehabilitation. One study by Schoen et al. assessed treatment outcome and impact on quality of life of prosthodontics rehabilitation with implant-retained prostheses in head-neck cancer patients. Fifty patients were evaluated by standardized questionnaires and clinical assessment. All received the implants during ablative tumor surgery in native bone in the inferior foraminal area. About two-thirds of the patients (n=31) need radiotherapy post-surgery. Both in irradiated and non-irradiated bone two implants were lost 18-24 months after installation. The 35 patients all functioned well, with an improvement in quality of life. Major improvement was observed in the non-irradiated patients. In the irradiated patients, less improvement in many functional items was observed, while items related to the oral sequelae of radiotherapy did not improve. Similar to the quality-of-life assessments, denture satisfaction was improved and tended to be higher in non-irradiated

than irradiated patients. Implant-retained lower dentures can substantially improve the quality of life related to oral functioning and denture satisfaction in head-neck cancer patients [21].

Doing the placement of the implants during the removal of tumor surgery has become some advantages, one of which allows for performing the surgery in bone without RT (radiotherapy) lowering the risk of osteoradionecrosis. Also, this allows osteointegration before RT and obturator prosthesis can be executed, allowing a better adaptation to speech and chewing, however, placing the implants after the tumor removal surgery can lead to a better position of the implants, allows that the implants will not delay treatment, special RT, reduces the risk of complications after surgery, and also facilitates healing of the tissues [20,21].

The oral rehabilitation of these patients is a complex process that sometimes takes years to achieve final results. The decision in which type of prosthesis is the ideal for the patient is an important decision because it is imperative to consider how this will affect the function and the improvement of quality of life. Radiotherapy causes some side effects such as: pain, erythema, edema, ulceration, fungal infection, dysgeusia, trismus, reduced salivary flow, inability to use dentures. Late effects are loss of keratinization (something very important in an implant oral rehabilitation), epithelial atrophy, xerostomia, cavities, delayed healing, impairment of bone remodeling and osteoradionecrosis [22]. Surgical treatment of malignancies in the oral cavity and subsequent radiotherapy often result in an anatomic and physiologic oral condition unfavorable for prosthodontics rehabilitation. On study evaluated the treatment outcome in a group of twenty-six head and neck cancer patients who were subjected to radiotherapy after tumor surgery. Branemark implants were placed in the anterior part of the mandible of patients given antibiotic prophylaxis (thirteen patients) or with antibiotic prophylaxis combined with pre and post-surgery hyperbaric oxygen (HBO) treatment (thirteen patients). In the HBO and non-HBO group eight implants (implant survival 85.2%) and three implants (implant survival 93.9%) were lost respectively. Peri-implant tissues had a healthy appearance in both groups. Osteoradionecrosis developed in one patient in the HBO group. All patients functioned well with their implant-retained lower denture. Implant-retained lower dentures can improve the quality of life related to oral functioning and denture satisfaction in head and neck cancer patients. Adjuvant hyperbaric oxygen therapy could not be shown to enhance implant survival in irradiated mandibular jaw bone [23].

Ablation of oral tissues and radiotherapy render many patients unable to wear conventional prosthesis, and these patients are, thus, candidates for oral rehabilitation with osteointegrated implants. 81 consecutive patients, most of whom had received microvascular free flap reconstruction after surgical ablation of oral squamous cell carcinoma. Three hundred eighty-six implants were placed after a delay of twelve months after surgery. Sixty-five percent of implants were placed in the anterior mandible. Radiotherapy was used in 47% of the patients, and hyperbaric oxygen treatment was routinely used in irradiated subjects during the latter half of the series. Two hundred sixty-five (73%) of the implants were in function supporting prosthesis, fifty-six (15%) had been lost, and forty-three (12%) were present but not loaded (i.e., "sleepers"). Thirteen percent of patients in whom implants were placed in the mandible lost at least one implant, and the equivalent values for the maxilla were 40%. Thirty-six percent of patients in whom implants were placed in bone graft or flap lost at least one implant. The effects of implant manufacture, dimensions,

radiotherapy, and hyperbaric oxygen did not demonstrate statistical significance in this series. Cases of a second primary malignancy were noteworthy; however, the impact of recurrence was minimized by the delay between resection and rehabilitation of the forty-two fixed and twenty-nine removable prostheses fitted, twelve (17%) failed. Radiotherapy did not seem to prejudice implant survival, and hyperbaric oxygen did not show demonstrable benefit in this series. Despite some persistent soft tissue problems and implant loss, most patients reached a successful prosthetic and functional outcome [24].

Werkmeister et al. did a study in the risks and complications of rehabilitation with dental implants after tumor surgery and radiotherapy. After a disease-free survival of eighteen months, twenty-nine patients who had undergone oral cancer treatment were rehabilitated with dental implants. The complication rate of implants in irradiated, non-irradiated and grafted bone was analyzed at least three years after implant placement. In the healing period, 28.6% of the implants in irradiated bone and 8.4% in non-irradiated bone showed tissue complications. Of the implants, 26.7% in the irradiated and 14.7% in the non-irradiated mandibular bone were lost in the first thirty-six months after placement. Approximately 31.2% of implants inserted in non-irradiated bone grafts were affected and did not Osseointegrate. Of one hundred and nine inserted implants, seventy were suitable for prosthetic rehabilitation. There are high complication rates after implant placement in oral cancer patients. Irradiation adversely affects soft tissue healing. Osseointegration is frequently disturbed, especially when implants were placed in non-vascularized bone grafts [25].

Granstrom did a retrospective study to evaluate implant survival of six hundred and thirty one Osseointegrated implants installed in irradiated cancer patients over a 25-year period. In this group compared with a control group of non-irradiated patients, implant failures were higher after previous radiotherapy. High implant failures were seen after high dose radiotherapy. All craniofacial structures were affected, but the highest implant failures were seen in the frontal bone, zygoma, mandible, and nasal maxilla. There was less prevalence of lower implant failures were seen in the oral maxilla. The use of long fixtures, fixed retention, and adjuvant hyperbaric oxygen therapy decreased implant failures [26].

Surgical treatment of malignancies in the oral cavity (tongue, floor of the mouth, alveolus, buccal sulcus, oropharynx) often results in an unfavorable anatomic situation for prosthodontic rehabilitation. Radiotherapy, which often is applied post surgically, worsens oral functioning in many cases. Surgical interventions after radiotherapy are preferable to avoid this secondary to compromised healing, which may lead to development of radio necrosis of soft tissues and bone, as well as increasing the incidence of implant loss. If surgical treatment after radiotherapy is indicated, measures to prevent implant loss and development of radio necrosis have to be considered e.g. antibiotic prophylaxis and/or pre-treatment with hyperbaric oxygen (HBO). To avoid this problem, implant insertion during ablative surgery has to be taken in consideration if postoperative radiotherapy is scheduled or possibly will be utilized. This approach is in need of thorough pre-surgical examination and multidisciplinary consultation for a well-established treatment plan. The primary curative intent of the oncological treatment and the prognosis for later prosthodontics rehabilitation must be taken into account [27].

In the last years, immediate surgical reconstruction of the complex soft-tissue and bone defect caused by the tumor surgery using vascularized free flaps has revolutionized post-surgical oral

reconstruction and dental prosthetic rehabilitation [28]. The use of Osseointegrated dental implants require selective prosthetic treatment following ablative surgery and has been found to be beneficial in some cases [29,30]. Concerning the reconstruction choice between fixed or removable prostheses, technical considerations are important: implant position, aesthetic result, psychological considerations acceptability of a removable prosthesis; and lastly the economic possibilities [28].

In patients bone reconstruction with free vascularized or non-vascularized grafts, implants can be inserted in the first surgical stage, in the second surgical stage after six-eight months. Therefore, we call the first technique a primary insertion and the second a postponed insertion [31-33]. Some considerations are needed regarding the choice of fixed or removable prosthesis [28].

Fixed implant supported prosthesis would be better, rather than a removable option, considering the ankylosis relationship established between the implant and the bone [34-36].

As for prosthetic rehabilitation of the irradiated patients, the removable prostheses implant-retained (over denture) seem to expose those patients to a higher risk of mucosa ulceration caused by the continuous inflammatory condition of the tissues. A fixed prosthesis operation that would adhere on to the implants would be better choice, considering the ankylosis relation established between the implant and the bone [34-36].

## Conclusion

In the case of HNC patients, the oral rehabilitation should be individualized situation, because all patients are different, and will hence require therapy options. Therefore, the multidisciplinary team must make the effort to give this patient the best oral rehabilitation according to the clinical condition. The patient must understand that after going oral rehabilitation they must comply with periodic evaluations [12,13].

The oral rehabilitation in HNC patients, is a complex process, however after reviewing the articles, it can be surmised that utilizing implants is successful even considering the complications that are involved in the rehabilitation of this patient [22]. After one year, the implant failures rates due to a resorption of the marginal bone of the implants pertaining fixed prostheses, is around 2.4% for the upper jawbone and 1% for the mandible. Contrasting, the percentages of failure in case of over denture (mobile prosthesis anchored to the implants), was 4.5% for the jawbone and 2% for the mandible [35,37]. A removable prosthesis after oral mucosa cancers ensures good control of the mucosal to be evaluated by surgeon. At the same time, good hygiene control by the patient, who often has problems of alcoholism or a smoker whom typically have poor dental hygiene; factors which can simply cause periimplantitis and even oncological relapses. Also, friction created by the prosthesis causes mechanical courting can bring about local irritation and ulcer formation [28].

The multidisciplinary team must have in mind all the factors involved in the oral rehabilitation of HNC patient, discussing each individual case, considering all variables, and choosing the best option for each HNC patient that will undergo oral rehabilitation [22].

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