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# Optimizing Palliative Care in Oral Rehabilitation for Head and Neck Cancer Patients: Insights and Considerations

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**Abstract**

Oral rehabilitation in head and neck cancer patients poses a formidable challenge for the attending physician due to its potential impact on a range of vital functions, including speech, swallowing, oral secretion management, and mastication. Given that patients are forever altered by surgical interventions, the primary objective of oral rehabilitation is to restore these essential functions post-surgery. The extensive array of side effects resulting from the multifaceted treatments undergone by head and neck cancer patients encompasses issues like xerostomia, mucositis, dysgeusia, dental hypersensitivity, fungal infections, ulceration, gingival bleeding, trismus, pain, reduced salivary flow, and the inability to utilize removable prostheses. All of these side effects must be taken into account throughout the oral rehabilitation process, as they significantly influence the success or failure of the patient's rehabilitation. The strategies and techniques employed for the rehabilitation of head and neck cancer patients are intricately linked to factors such as the type of cancer, its extent (invasive or non-invasive), involvement of lymph nodes and metastases, the type of surgery performed, and the modalities of radiation therapy utilized.

**Keywords:** Head and neck cancer; Oral rehabilitation; Dental implants; Radiotherapy; Oncological relapses; Oral hygiene control; Ulcer formation; Osseointegration

## Introduction

Head and neck cancer (HNC) is a global health concern, with approximately 390,000 new cases reported annually worldwide. It ranks as the 11th most common malignant tumor on a global scale, constituting 5% of all malignancies. HNC predominantly affects men, with a male-to-female ratio ranging from 2 to 5 to 1, depending on the tumor's location [1-4]. Prognosis in HNC patients is intricately linked to the primary tumor's location, size, lymph node involvement, and the patient's age. The 5-year survival rate remains alarmingly below 50%, with a somewhat more favorable outlook for women. Regrettably, advancements in treatment modalities have had limited impact on survival rates over the past four decades. In the United States, oral and pharyngeal cancer diagnoses are expected to reach 43,250 cases this year, resulting in over 8,000 deaths, equating to roughly one life lost every hour, 24 hours a day. Of the newly diagnosed cases, slightly over half are projected to survive beyond a 5-year period, with a survival rate of approximately 57%. This statistic has seen minimal improvement over the years. HNC represents a devastating disease that not only inflicts physical changes but also imposes significant emotional and social challenges on patients. This multifaceted impact detrimentally influences their overall quality of life [5].

## Materials and Methods

This literature review article utilized various databases, including Medline, PubMed (1996-2013), Cochrane Control Trial Records (2012), Embase (1980-2013), and LILACS (1982-2013). The search strategy aimed to identify the maximum number of relevant studies within each database [6,7]. The search terms employed encompassed head and neck cancer, dental implants, oral rehabilitation, osteonecrosis, radiotherapy, chemotherapy, and surgery.

## Discussion

Following surgical and adjunctive treatments like radiotherapy and chemotherapy, oral rehabilitation becomes a crucial aspect of head and neck cancer (HNC) patient care. Comprehensive comprehension of HNC is essential prior to embarking on rehabilitation, with the primary objective being the restoration of a patient's quality of life. This involves the preservation of essential functions like speech and mastication that may be compromised post-surgery [8,9].

In cases involving the removal of substantial portions of the tongue, floor of the mouth, mandible, hard and soft palate, and regional lymph nodes, extensive rehabilitative interventions are typically required.

- Current rehabilitative practices revolve around five key principles:
- The rehabilitation process initiates at the time of initial diagnosis and treatment planning.
- Preservation of the patient's dentition whenever possible.
- Rehabilitative treatment plans are rooted in fundamental prosthodontic principles, emphasizing preventive and conservative restorative dentistry.
- In some instances, surgical interventions precede prosthetic rehabilitation to enhance the anatomical configuration post-cancer surgery, reconstructive surgery, and/or radiation therapy.
- The optimal function necessitates a multidisciplinary approach to cancer care.
- In the rush to address the pressing need for tumor treatment, planning for rehabilitation often gets delayed. However, a collaborative

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and dynamic dialogue among healthcare providers during the initial treatment planning process is crucial to ensuring the provision of optimal rehabilitative care.

Several factors can influence the cancer surgical treatment plan within the realm of rehabilitation, including:

a) The patient's prognosis and systemic status. b) The potential size and location of the defect. c) Adjunctive therapies (e.g., chemotherapy or radiation) that may affect the surgical outcome. d) Anticipated changes in function and aesthetics post-cancer surgery, as well as the availability, accessibility, and cost of rehabilitative procedures.

Oral rehabilitation has witnessed continuous evolution since the 1960s, marked by the introduction of new techniques and biomaterials [10]. Notably, osseointegrated implants have emerged as a significant advancement in dentistry, serving to replace lost teeth and support prostheses in patients with substantial post-cancer surgery defects.

Pioneered by Branemark et al., osseointegration involves implant materials that structurally and functionally integrate with bone [11], with key success factors including:

- The use of biocompatible implant materials.
- Non-traumatic, aseptic surgical procedures.
- A deferred initial healing period before functional loading of forces.
- Stress-reducing prosthodontic procedures.

Osseointegration has found acceptance in the rehabilitation of maxillary-resected patients and implant-retained facial prostheses are now employed in major cancer centers worldwide. Physicians must conduct thorough psychosocial assessments to determine the most suitable oral rehabilitation approach for each patient. This includes assessing the available tissue and bone after tumor removal and selecting the appropriate prosthodontic options, such as implants, fixed prostheses, or removable implant-supported prostheses [12].

Numerous studies have been conducted on oral rehabilitation, with one study by Schoen et al. evaluating the treatment outcome and its impact on the quality of life of head-neck cancer patients undergoing prosthodontic rehabilitation with implant-retained prostheses. The study found that these implants significantly improved the patients' quality of life and denture satisfaction, particularly in non-irradiated patients, although irradiated patients also experienced improvements in various functional aspects.

The timing of implant placement during tumor removal surgery offers distinct advantages. Implant placement during surgery allows for a bone-based approach without requiring radiotherapy (RT), thereby reducing the risk of osteoradionecrosis. It also enables osseointegration to occur before RT, facilitating the subsequent execution of an obturator prosthesis and better adaptation for speech and mastication. However, placing implants after tumor removal surgery can lead to a more optimal implant position, avoiding treatment delays, especially with regard to RT. It also minimizes the risk of complications after surgery and promotes tissue healing [13].

The oral rehabilitation of HNC patients is a complex and often time-consuming process. The choice of prosthesis type is a critical decision, considering its impact on function and the enhancement of the patient's quality of life. Radiotherapy can result in several side effects, including pain, erythema, edema, ulceration, fungal infection, dysgeusia, trismus, reduced salivary flow, and denture intolerance. Late effects encompass the loss of keratinization (crucial in implant-based oral rehabilitation), epithelial atrophy, xerostomia, cavities, delayed healing, impaired bone remodeling, and osteoradionecrosis. Surgical treatments for oral malignancies followed by radiotherapy often create an anatomically and physiologically unfavorable oral condition for prosthodontic rehabilitation. A study examined the treatment outcomes in twenty-six head and neck cancer patients who underwent radiotherapy after tumor surgery. Branemark implants were placed in the anterior mandible with antibiotic prophylaxis alone in thirteen patients or in combination with pre- and post-surgery hyperbaric oxygen (HBO) treatment in thirteen patients. Implant survival was 85.2% in the HBO group and 93.9% in the non-HBO group, with healthy peri-implant tissues. One patient in the HBO group developed osteoradionecrosis. All patients experienced improved oral function and denture satisfaction with their implant-retained lower dentures [14].

The removal of oral tissues and radiotherapy often renders patients unable to wear conventional prostheses, making them candidates for oral rehabilitation with osseointegrated implants. A study involving 81 consecutive patients who had undergone surgical ablation of oral squamous cell carcinoma and microvascular free flap reconstruction placed 386 implants after a twelve-month post-surgery delay. A majority of these implants were placed in the anterior mandible, with 47% of patients receiving radiotherapy and some receiving hyperbaric oxygen treatment. Of the implants, 73% were in function supporting prostheses, 15% were lost, and 12% were present but not loaded. Implants in bone graft or flap had a higher loss rate. Factors like implant manufacture, dimensions, radiotherapy, and hyperbaric oxygen did not show statistical significance in this series. Recurrence of primary malignancies was noted but minimized by the delay between resection and rehabilitation. Out of the forty-two fixed and twenty-nine removable prostheses fitted, twelve (17%) failed. Radiotherapy did not seem to compromise implant survival, and the use of hyperbaric oxygen did not demonstrate significant benefits in this series. Despite some ongoing soft tissue issues and implant loss, most patients achieved successful prosthetic and functional outcomes.

In a study conducted by Werkmeister et al., the risks and complications associated with dental implant rehabilitation after tumor surgery and radiotherapy were explored. After a disease-free survival of eighteen months, twenty-nine patients who had previously undergone oral cancer treatment received dental implants. The study analyzed the complication rates of implants placed in irradiated, non-irradiated, and grafted bone, with a follow-up of at least three years after implant placement. During the healing period, 28.6% of implants in irradiated bone and 8.4% in non-irradiated bone exhibited tissue complications. In the first thirty-six months after implant placement, 26.7% of irradiated and 14.7% of non-irradiated mandibular implants was lost [15]. Approximately 31.2% of implants inserted in non-irradiated bone grafts were affected and failed to osseointegrate. Out of 109 inserted implants, seventy were suitable for prosthetic rehabilitation, highlighting the high complication rates associated with implant placement in oral cancer patients. Irradiation adversely affects soft tissue healing, and osseointegration is often disrupted, particularly when implants are placed in non-vascularized bone grafts. In a retrospective study conducted by Granstrom, the survival of 631 osseointegrated implants in irradiated cancer patients over a 25-year period was evaluated. Compared with a control group of non-irradiated patients, a higher rate of implant failures was observed in the group that had undergone previous radiotherapy. High implant failure rates were associated with high-dose radiotherapy, affecting various

craniofacial structures, with the highest implant failures occurring in the frontal bone, zygoma, mandible, and nasal maxilla. A lower prevalence of implant failures was noted in the oral maxilla. The use of long fixtures, fixed retention, and adjuvant hyperbaric oxygen therapy reduced implant failures.

Surgical treatment of malignancies in the oral cavity often creates an unfavorable anatomic situation for prosthodontic rehabilitation, particularly in cases involving the tongue, floor of the mouth, alveolus, buccal sulcus, and oropharynx. Post-surgical radiotherapy exacerbates oral functioning issues. Surgical interventions after radiotherapy are preferable to avoid compromised healing, which may lead to the development of radio necrosis in soft tissues and bone, increasing the risk of implant loss. Surgical treatment after radiotherapy requires careful consideration, including measures to prevent implant loss and radio necrosis development, such as antibiotic prophylaxis and/or pre-treatment with hyperbaric oxygen (HBO). Implant placement during ablative surgery should be considered if postoperative radiotherapy is scheduled or likely to be utilized. This approach necessitates thorough pre-surgical examination and multidisciplinary consultation to establish a well-defined treatment plan. The primary focus should always be on the oncological treatment's curative intent and the prognosis for subsequent prosthodontics rehabilitation. In recent years, immediate surgical reconstruction of complex soft-tissue and bone defects resulting from tumor surgery using vascularized free flaps has revolutionized post-surgical oral reconstruction and dental prosthetic rehabilitation. The use of osseointegrated dental implants requires selective prosthetic treatment following ablative surgery and has proven beneficial in some cases. The choice between fixed or removable prostheses depends on technical considerations such as implant position, aesthetic outcomes, psychological considerations related to the acceptability of a removable prosthesis, and economic factors.

## Conclusion

In the case of head and neck cancer (HNC) patients, oral rehabilitation is a highly individualized process, as each patient present's unique clinical conditions and therapy needs. Therefore, the multidisciplinary team must exert significant effort to provide the best possible oral rehabilitation for each patient. Patients must also understand that they will require periodic evaluations following their oral rehabilitation. Oral rehabilitation in HNC patients, though complex, has been shown to be successful, even when considering the associated complications. One year after implant placement, the failure rates for implants supporting fixed prostheses due to marginal bone resorption are approximately 2.4% for the upper jaw and 1% for the mandible. In contrast, the failure rates for over dentures (removable prostheses anchored to implants) are higher, at 4.5% for the jawbone and 2% for the mandible. Using a removable prosthesis after oral mucosa cancers offers advantages such as better control over mucosal evaluation by the surgeon and facilitates oral hygiene control, which is particularly important for patients who may struggle with alcoholism or smoking and thus have poor dental hygiene. These factors can lead to peri-implantitis and even oncological relapses. However, it's important to note that the friction created by the prosthesis can lead to mechanical irritation and ulcer formation. The multidisciplinary team should take into consideration all factors involved in the oral rehabilitation of HNC patients, carefully assessing each individual case, considering all variables, and selecting the most appropriate option for each patient undergoing oral rehabilitation.

## Acknowledgement

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## Conflict of Interest

Author declares no conflict of interest.

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