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Scope of prosthodontic services for patients with head and neck cancer

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Abstract

Patients with head and neck cancer face high morbidity due to the disease and its treatment and are affected on a variety of personal and physical levels. Maxillofacial prosthetics offer support for other disciplines in a multidisciplinary setting; can help to prevent / minimize the sequelae from disease and treatment, and offers the patient help in the rehabilitation process. Maxillofacial prosthodontics focuses on optimizing the disrupted rudimentary function of individuals whose rehabilitation will be a lifelong proposition. Normal function may not be achieved but optimal function should always be achieved and the patients can lead a near to normal life.

Key words: Head and neck cancer, prosthodontic rehabilitation, quality of life

Introduction

Advances in the management of oral malignancy have resulted in significant improvements in survival rate.^[1] This has led to a large number of patients with extensive post-surgical defects and disfigurement. The cosmetic, functional and psychological results of oral cancer treatment may combine to produce devastating effects which affect the patient's quality of life (QOL).^[2] The thrust in cancer care is not simply on survival but on rehabilitation, which aims to improve multiple impairments and QOL.

The goal of prosthodontic rehabilitation is to minimize morbidity and relieve suffering following treatment of head and neck cancer. It encourages the best possible QOL for patients and upholds their self-image during their traumatic psychological adjustments.

The World Health Organization (WHO) had defined quality of life as individuals' perception of their position

in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. Quality of life considers individual wellbeing, spiritual belief and satisfaction. Health-related quality of life revolves around four domains^[3] [Figure 1].

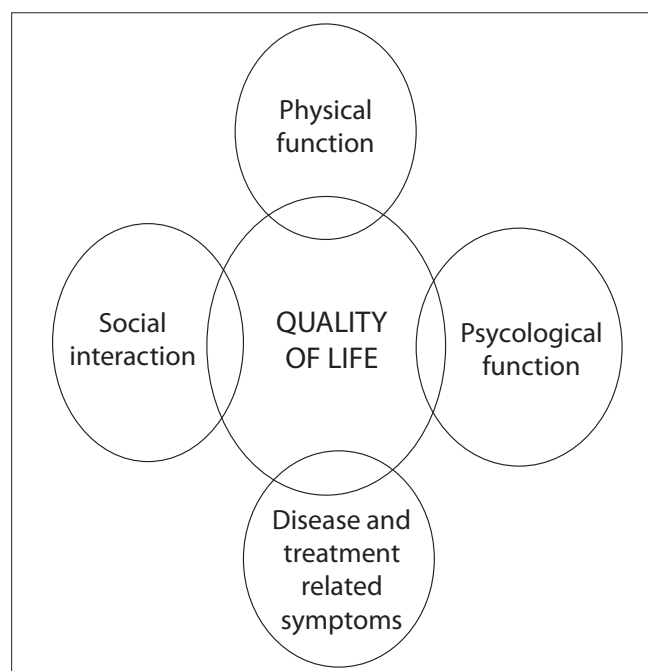


Figure 1: Quality of Life

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Role of a prosthodontist as a member of the multidisciplinary team

Patients who have had surgery will often require prosthodontic rehabilitation to improve the mastication, speech, swallowing and to improve their QOL and reintegrate into society. Prosthodontic rehabilitation of such patients is rather challenging and requires coordinated integration within a multidisciplinary team.^[4-6] Members of the team often include an oral-maxillofacial surgeon, radiologist, oncologist, neurosurgeon, otolaryngologist, prosthodontist, speech therapist and social worker amongst others to treat the individual patients' physical, social-psychological and spiritual problems. As a critical member of the team, the maxillofacial prosthodontist coordinates the efforts in many facets of the patient's rehabilitation care. The prosthodontist is involved in diagnostic examination, restoration, maintenance of oral functions, comfort, esthetics and health of patients who are undergoing surgery, chemotherapy and/or radiotherapy for head and neck cancer. Care should be patient-centered and patient-directed.

Scope of maxillofacial prosthetic services

The scope of services provided by a maxillofacial prosthodontist presents a wide array of rehabilitative challenges. Maxillofacial prosthetic treatment is not a substitute for plastic and reconstructive surgery; in certain circumstances, it may be an alternative. Some patients are not good candidates for plastic surgery because of advanced age, poor health, type of deformity or poor blood supply to irradiated tissue. Moreover, prosthetic treatment is indicated when anatomical parts are not replaceable by living tissue, when recurrence is likely, and when radiotherapy is administered. Prosthetic rehabilitation has specific advantages, since in general it requires little or no additional surgery, and the results are often more or as esthetically pleasing, and from the patient's perspective is less drastic than plastic surgery. The primary concern of the treatment is to assure that the oral cavity is prepared to reduce potential untoward effects of cancer treatment, educate the patients for the possible short-term and long-term complications, and train the patients in oral hygiene methods and therapeutics for oral health preservation. Long-term follow-up, evaluation and treatment of the cancer patient with an eye on the possibility of recurrence are a part of the crucial contribution by the prosthodontist as well.^[7]

Surgical defects requiring maxillofacial prosthesis

Head and neck patients requiring surgical resection often require maxillofacial prosthodontic rehabilitation as an integral facet of cancer care. Restoration of speech, swallowing, control of saliva, mastication and restoration of facial deficits are the primary objectives of

maxillofacial rehabilitation. The strategy and techniques of rehabilitation are directly related to the cancer site, its extent and type of surgical intervention, and radiation / chemotherapy modalities used.^[8]

During the rehabilitation process, some basic principles are to be followed. The process of rehabilitation preferably begins at the time of initial diagnosis and treatment planning. Preservation of the remaining sound natural teeth is an important asset in the rehabilitation of intraoral defects. Rehabilitation plans should adopt a multidisciplinary approach, considering the philosophy of preventive and conservative dentistry to achieve the best functional, physical and psychological outcomes. Surgical enhancement may be indicated to improve the existing anatomic configuration after ablative cancer surgery, reconstructive surgery and/or radiation therapy.^[9]

Factors influencing the treatment plan include prognosis and systemic status of the patient, site and size of the defect, nature of functional and/or cosmetic defect, adjunctive therapy (e.g. radiotherapy and/or chemotherapy) that may compromise the surgical result, anticipated changes to function and cosmesis, based on the cancer surgery and the availability, accessibility, and cost of rehabilitation procedures.

Tumors that require maxillary resection will create defects of the maxilla, palate or adjacent soft palate, ranging from small perforations to extensive resections leading to a variety of sequelae. Hypernasality renders speech incomprehensible, mastication and deglutition dysfunction, regurgitation of foods and liquids, uncontrolled oral secretions and facial disfigurement. Prosthodontic intervention with a maxillary obturator is necessary to restore the contours of the resected palate and to recreate the functional separation of the oral cavity, sinus and/or nasal cavity.^[10] It should occur at the time of surgery and is best accomplished in three stages. Immediate surgical obturator, inserted at completion of surgery, separates the oral and nasal cavities, provides support for the remaining soft tissues of the cheek and lip, minimizes wound contamination and enables the patient to speak and swallow immediately after surgery [Figure 2]. Interim obturator replaces the surgical obturator and is worn during the postoperative healing period. Definitive obturator prosthesis is a more permanent prosthesis designed and fabricated when the surgical site is stable^[11] [Figure 3]. A precise impression of the defect is made for the fabrication of the prosthesis that allows maximum distribution of forces to all available teeth, remaining hard palate, lateral walls of the defect and remaining alveolus. Soft palate speech bulb prosthesis can be used for patients who have soft palate insufficiency to allow speech and

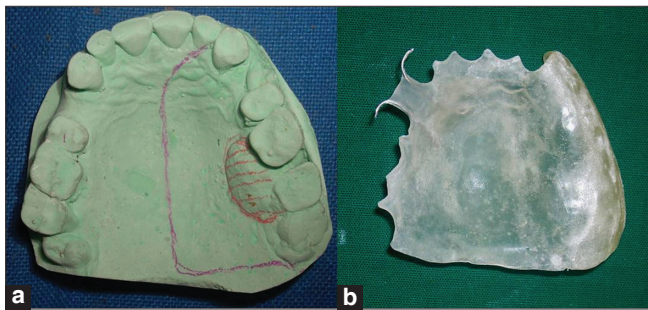


Figure 2: (a) Palatal defect planned for excision, (b) Surgical stent to be placed immediately after surgery



Figure 3: Complete denture with definitive obturator



Figure 4a: Segmental resection of the mandible showing deviation and improper occlusion



Figure 4b: Guide plane prosthesis placed intraorally



Figure 4c: Intraoral view showing teeth in occlusion

swallowing. A palatal lift prosthesis can be provided for patients with speech disorders due to palatopharyngeal incompetence after oncological therapy, e.g. due to scarring of the velar tissues. The purpose of this type of prosthesis is to obtain a velopharyngeal closure by displacing the soft palate at the palatal plane. Once the soft palate is elevated, the surrounding pharyngeal walls ideally can complete closure of the nasopharyngeal portion.

Mandibular and tongue defects

The disabilities resulting from resections of the tongue, floor of the mouth, or mandible would include impaired speech, articulation, and difficulty in swallowing, deviation of the mandible during functional movements, poor control of salivary secretions and often, cosmetic disfigurement. In case of bony mandibular resections, if the continuity is not restored surgically, mandibular guidance appliances, sectional dentures or resection prosthesis with a guide flange to direct the mandible to an appropriate intercuspal position can be made [Figures 4a, b, c]. Palatal ramps on maxillary prosthesis are used to decrease functional disabilities combined with a well-organized mandibular exercise program. The severity of the morbidity associated with composite resection of the tongue, floor of the mouth and mandible is greatly reduced by the introduction of microvascular free flap transfer^[12-15] and the use of osseointegrated implants.^[16,17] A free tissue transfer with the fibula allows the placement of dental implants to support resection prosthesis.^[18,19]

Extra-oral facial defects

Rehabilitation of facial defects for patients who have lost an eye, ear, nose or sustained damage to intraoral structures by an artificial prosthesis can immensely change the quality of life.^[20,21] Different prosthetic approaches are required depending on the type of defects, e.g. ocular prostheses are simpler compared to orbital defect.^[22] [Figure 5a, b]. Such treatment has its own limitations due to the availability of material, movable tissue beds, difficulty in retaining prosthesis, and the patient's coping capacity to accept the result. There has been a paradigm shift in the use of retention mechanisms for facial prostheses, like adhered to spectacles, adhesive-retained or implant-retained. Use of implants has changed the patients' perception about prostheses. Improved retention enhances patient comfort, changed daily maintenance, and increased life span of the prosthesis.^[23-25] Commonly used material for facial prostheses, which have achieved wide clinical acceptance, are silicone elastomers. Currently, many facial and craniofacial defects are reconstructed with a combination of microvascular free flap, tissue expanders

and use of maxillofacial prosthesis [Figure 6a, b].

Dental care prior to radiation and chemotherapy

A complete oral and dental evaluation before radiotherapy includes taking radiographs, hard and soft tissue examinations, periodontal and caries examination. A proper treatment plan should be formulated. Carious teeth should be restored. Hopeless or questionable teeth including root fragments in the field of radiation must be removed. Preprosthetic surgery may be necessary to remove a potential source of infection or anatomic interferences for future prosthetic placement. Oral prophylaxis and home care instructions should be provided.^[26,27] Before radiation treatment begins, flexible mouth guards can be fabricated which cover the teeth and are used to apply topical fluoride to prevent the onset of radiation-induced tooth decay.

Use of prosthodontic splints and stents in radiotherapy

Radiotherapy is increasingly being used as an adjunctive



Figure 5a: Ocular defect



Figure 5b: Ocular prosthesis

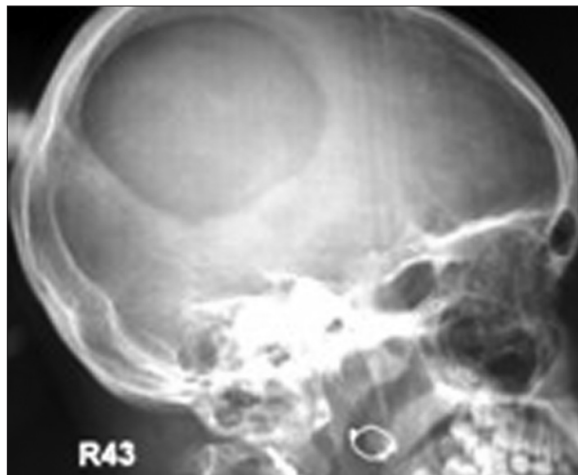


Figure 6a: Radiograph showing occipital defect

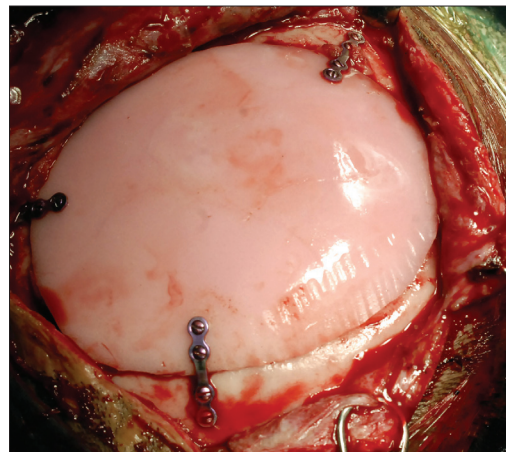


Figure 6b: Cranial plate made of heat polymerized methylmetacrylate resin and screwed to the defect

form of treatment in the management of head and neck cancer after surgery, either in combination with or without chemotherapy. These days radiotherapy or chemoradiation is used as primary treatment even without surgery, especially in oropharyngeal cancers. At some sites, the survival is claimed to be comparable with surgery. Unfortunately, this treatment causes complications by increasing morbidity to the surrounding sound tissues.

As a preventive measure, radiotherapy protective devices/stents can be fabricated and used during the treatment.^[28] These stents are used to protect or displace vital structures, locate diseased tissues in repeatable position during treatment, position the beam, carry radioactive material or a dosimeter device to the tumor site, and to recontour tissues to simplify dosimetry and shield tissues^[29] [Figures 7-10]. The prosthodontist can actively help by fabricating a whole array of possible prostheses, thereby limiting complications following therapy.^[30] Radiation of maxillary and hard palate tumors often include the temporomandibular joint and muscles of mastication, which causes stiffness of the joint, and muscles followed by trismus. Several

prosthetic aids such as bite openers or exercises devices can be used to help in the prevention of fibrosis of the muscles and to assist the patient in increasing the mouth opening to eat and maintain oral hygiene.^[31]

Patient education

Communication and education are key factors for accepting prosthesis. Successful use of prosthesis may depend on the patient's psychological acceptance of it. Patients' participation in the decision-making process with realistic expectations is of vital significance. They should be educated about the treatment choices and convinced of their personal responsibilities towards the use and care of the prosthesis. The need for professional re-evaluation on a frequent periodic schedule should be emphasized to determine its adaptability to soft tissues, stability, retention, tissue receptivity, occlusion function and esthetics.

Evolving trends

Relevant research on biomaterials, including

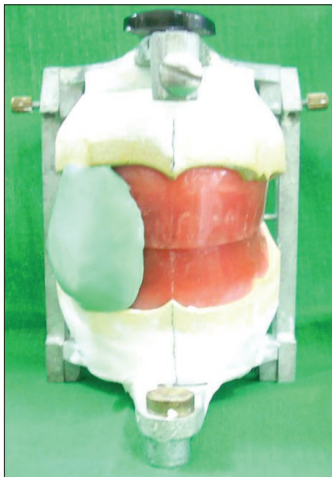


Figure 7: Shielding stent used to protect the vital structures adjacent to the radiation site



Figure 8: Position maintaining stent used to precisely position structures in repeatedly fixed position



Figure 9: Tongue-depressing stent

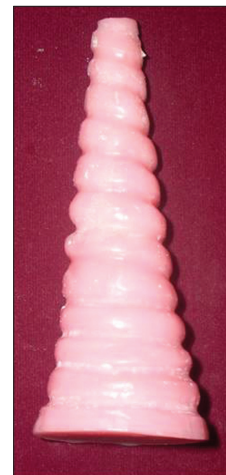


Figure 10: Acrylic key to help in mouth opening

osseointegrated implants, microvascular free flap tissue transfers, bone grafting, hyperbaric oxygen therapy, technological advances in imaging modalities, and use of implants^[32] have collectively enhanced rehabilitation outcomes. Technological innovations like CAD-CAM are revolutionizing the field. With Rapid Prototyping, a life-like prosthesis of the defect can be fabricated.^[33,34] Software allows virtual designing of prostheses enhancing the outcome and thus improving the quality of life. Development in the field of tissue engineering has resulted in the formation of new tissue equivalents of bone and cartilage that will augment the outcome of prosthodontic rehabilitation in future.^[35,36]

Conclusion

Prosthodontic rehabilitation broadens the range of possibilities for rehabilitation after head and neck Oncology treatment”, Preludes to the image restoration, confidence-giving treatment for patients who have suffered the ravages of head and neck cancer . The scope of prosthodontic services can be improved by education, public awareness, professional practice and availability of services.

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