

Provisional Prosthesis for Class 1 Radical Mandibular Alveolectomy Patient - A Case Report

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ABSTRACT

Prosthetic management of surgical defects has always been a big challenge for a prosthodontist. The sudden change in patient's perspective towards life affects the future outcome of any prosthetic rehabilitation. A good prosthesis can bring back the lost pride and smile on the patient face. A thorough understanding of post surgical anatomy and physiology is a prerequisite for the development of successful prosthesis. This article briefly covers the various anatomical and physiological factors towards successful prosthetic management of mandibular alveolectomy patient.

Keywords : Radical alveolectomy, Provisional prosthesis

INTRODUCTION

Since the sixteenth century acquired surgical defects have been restored by prosthetic replacements constructed from a variety of materials and techniques. The cosmetic, functional, and psychosocial results of oral cancer treatment may combine to produce devastating effects on patients, especially if the tumor is extensive or the treatment particularly aggressive. Indeed, oral cancer is noted for the toll it exacts from patients, from both the disease itself and the effects of its treatment. A variety of functions can be affected, including speech, deglutition, management of oral secretions, and mastication. Thus, maxillofacial prosthetic rehabilitation is a cornerstone of efforts to restore the head and neck cancer patient's oral functions and cosmetics following surgery to pre-treatment baselines.

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Maxillofacial prosthetic therapy for acquired defects has become more complex and sophisticated with advances in surgical, physical and rehabilitative medicine. Acquired defects of the orofacial structures must be analyzed as to the specific cause and the consequent objectives of rehabilitation.¹

The traditional concept of a one-time prosthesis that supplies the patient's requirements through the course of life is no longer realistic or valid. If the prosthesis is fabricated in an acceptable fashion to meet the physiologic, anatomic, functional and cosmetic requirements of the patient, there is no predictable method of calculating its longevity.

An understanding of post surgical anatomy and physiology is a prerequisite for the development of new prosthetic procedures for mandibulectomy patients. Only this understanding will permit functional utilization of these unusual postoperative anatomic conditions.

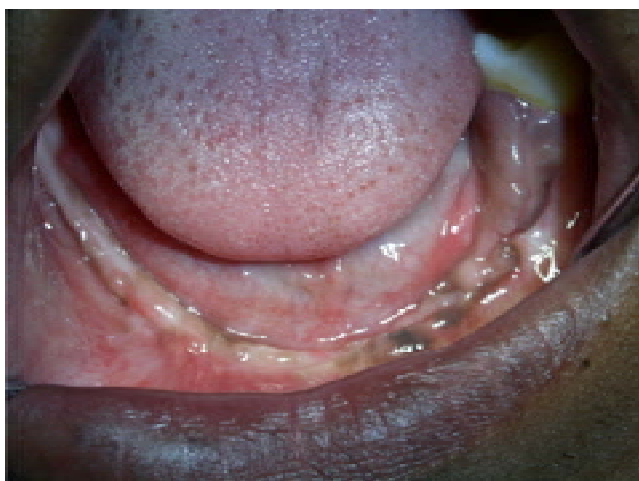
GENERAL PHYSIOLOGICAL CONSIDERATIONS

Swallowing, speech, mandibular movements, mastication, control of saliva, respiration, and psychic functioning are adversely affected by a radical mandibular surgery. These dysfunctions radically alter prosthetic prognosis. The degree of impairment and depends not only on the extent and type of surgery but also on the specific vulnerability of each function.

Deglutition

Normal deglutition is a primary process. A bolus of food is carried through the fauces and in to the pharynx by the dorsum of the tongue. The nasopharynx is closed by the soft palate, and the larynx is elevated. The soft palate, posterior part of the tongue, gravity and pharyngeal air pressure at combine to force the bolus of food into the dilated esophagus and that the peristaltic contractions transfer it to the stomach.

Postoperative swallowing can be temporarily or permanently impaired. However since swallowing is a primary function and not easily disrupted, the ability to swallow usually will return. Deglutition can be performed with the minimum of muscular tissue and even with the loss of such skeletal



Intraoral view of segmental mandibular defect

structure as the mandible and hyoid bone. With an intact larynx the voluntary closure of the epiglottis may be learned. This action combined with a “gulp” movement by passes much of the oral and pharyngeal phases of swallowing and throws the liquid into the esophageal phase and the initiation of peristaltic action.

Speech

Normal speech is a learned process and therefore it is influenced by vision, hearing, intelligence, motivation and imitation. A stream of air vibrates the vocal folds and produces laryngeal sound waves. The sound takes on a characteristic quality because of an atomic resonating chambers and is then broken up in to language sounds by the action of the tongue, lips, and cheeks. A high degree of central nervous system development is essential to coordinate the complex neuromuscular pattern associated with speech production. Kauntner and West have described the components of speech as respiration, phonation, resonance, articulation and



Maxillary impression in alginate

neurological interaction. The function of speech is easily disturbed and any of the speech components can be affected. However, speech distortions usually occur in mandibulectomy patients by impairment of the articulating mechanism and or alterations of the resonating chambers.²

The resonating chambers include the pharynx and the oral cavity. Scarring, compensatory over closure of the mandibular fragment, and tissue loss resulting in an undersized and immobile residual tongue combine to dramatically alter the form and resonating character of these spaces. Speech can become hollow, flat and muffled.



Mandibular provisional prosthesis (Lip Bumper)



Mandibular defect impression in alginate

Mandibular Movement And Mastication

Normal mastication is a learned, and automatic process giving rise to many individual variations. Despite the degree of learned differentiation, this function can often readjust following surgically insult.



Mandibular provisional prosthesis in occlusion

The components of occlusion have been described as the temporomandibular joints structures, the musculature of which activates the masticatory apparatus, and the denture bearing tissues. All these components are radically altered by mandibular surgery. Mandibular movements are partially controlled by bilateral actions of the temporomandibular joints and the disarticulation of the joint on one side will result in unilateral distortions. However, one advantageous characteristic of the temporomandibular joint is that, when one



Mandibular provisional prosthesis in oral cavity

joint is lost, the muscles of the maxillofacial group can substitute for each other and maintain a functional equilibrium. For example, the internal pterygoid and mylohyoid muscle pull the resected mandible medially or towards that defect, but the temporal and masseter muscle reciprocate in a superior and lateral direction. The ability of the muscles of mastication to maintain a functional equilibrium following the mandibulectomy can be easily overcome by scar contraction and it is therefore important to resist this scar displacement.

The muscles of mastication are normally in a state of equilibrium when the opposing teeth are contacting. The centric occlusal position of the mandibulectomy patient is medially displaced with a corresponding loss of vertical dimension. Masticatory force exerted along this deflected pathway by the patient is seldom capable of sufficiently coordinated muscular strength for normal mastication. In many instances the patient can approximate the presurgical centric occlusal position, but restoration of the original occlusal vertical dimension can interfere with compensatory speech and swallowing functions, and can diminish masticatory strength.

Saliva Control

Drooling and other problems associated with changes in salivary consistency and control comprise one of the most debilitating postsurgical sequel of mandibulectomy patients. These patients can suffer from too much or too little saliva.



Pre-treatment lateral view

Drooling, restricted tongue movements; difficulties in swallowing, the absence sulci (labial, buccal, and lingual), scarring of orbicularis oris; and the notching of the lower lip; as well as loss of sensory awareness will impair the patient's ability to control his salivary secretions. The role of hypersalivation in the genesis of the drooling is considered minimally significant by Smith and Goode when compared with failure to swallow salivary secretion or inability to retain accumulated secretions within the mouth. However, insertion of the resection prosthesis or denture irritation; can produce salivation. Although this component is usually temporary, extreme drooling during the adjustment period can demoralize the patient and permanently influence prosthetic treatment.

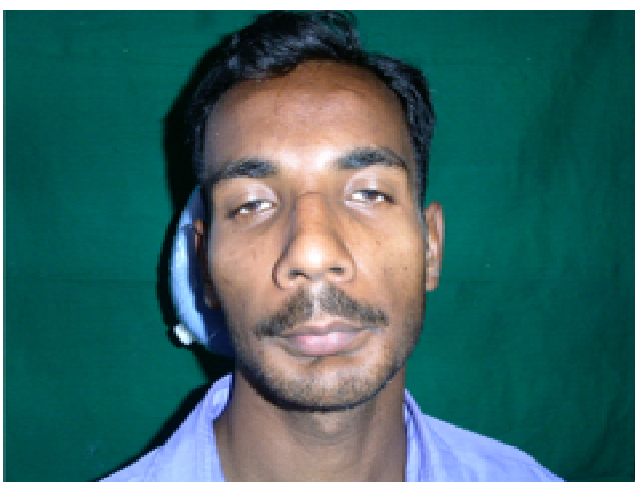
Xerostomia. A large number of mandibulectomy patients who have undergone a radiation therapy suffer from partial xerostomia and thick salivary secretions. When the salivary



Post treatment lateral view

glands are included in the field of irradiation, varying degrees of fibrosis, fatty degeneration, acinar atrophy (especially of the serous glands), and cellular necrosis takes place. The reduction in the amount of saliva present and its characteristic sticky quality will adversely affect denture retention, tissue tolerance, and taste. Fortunately there is often some regeneration of salivary function, but chronic dryness of the oral mucous membrane influences prosthetic therapy.

Respiration: Respiration is a primary processes that involves the maxillofacial structures. These structures should maintain a patent airway and must alter the physical properties of the inspired air to protect the sensitive lung tissue. The mandible and the associated structures must alter their relationship to the skull and cervical spine in order to maintain the patency of the airway during postural changes and therefore there is no consistent physiologic rest position. This variability of rest position permits constant maintenance of an optimal expenditure of energy.



Pre treatment frontal view

CLASSIFICATION OF SURGICAL IMPAIRMENT (CANTOR AND CURTIS)³⁴

- Class I - Radical alveolectomy with preservation of mandibular continuity
- Class II - Lateral resection of the mandible with distal to the cuspid
- Class III - Lateral resection of the mandible to the midline
- Class IV - lateral bone graft surgical reconstruction
- Class V - Anterior bone graft surgical reconstruction
- Class VI - Resection of anterior portion of the mandible without reconstructive surgery to unite the lateral fragments

Class I

The tissues resected on the affected side include:

1. A portion of the alveolar process and body of the mandible
2. The mucoperiosteum of the mandible
3. The lingual and buccal sulcus mucosa
4. A portion of the base of the tongue and mylohyoid muscle;
5. The lingual and inferior alveolar nerves
6. The sublingual and submaxillary salivary glands
7. Sometimes the anterior part of the digastric muscle

The structures that remain on the affected side are essentially normal and include the following:

1. An intact lower border of the mandible
2. all primary and auxillary muscles of mastication
3. most of the tongue
4. Mylohyoid muscle with the exception of scar tissue in the region of resection

Patients in this group function quite normally, although resection of part of the mylohyoid muscle and resultant scarring can interfere with raising the floor of the mouth, and this often causes some reduction in tongue mobility. The ability to shape and control tongue form can be impaired also by loss of some of the intrinsic muscles. Resection of the lingual and inferior alveolar nerve result is in the loss of sensation in the mucosa of the cheek, alveolar process, lower lip, and the epithelium of the lower part of the face and loss of taste on the anterior two-thirds of the tongue. Motor control by the mylohyoid muscle can be impaired and motor function of the tongue is affected if the hypoglossal nerve is lost.



Post treatment frontal view

CLINICAL REPORT

A 27 year old male patient was referred to the Department of Prosthodontics from the Department of Oral and Maxillofacial Surgery (SDM College of Dental Sciences, Dharwar) for post-mandibulectomy prosthetic rehabilitation (fig.1). The patient was diagnosed for squamous cell carcinoma of the mandible and a Class 1 Radicular mandibulectomy was performed extending from left first molar to right second molar, before being referred.

After thorough intraoral examination and complete case history recording, impressions were made. A stock metal tray was modified at its border to record an extended lingual sulcus (sublingual flange) and a mandibular alginate impression (fig.2) (Zelgan, Dentsply, India) was made and model poured in dental stone (Kalstone, Kalabhai, India).

A face bow record was made and maxillary cast was articulated on a semi-adjustable articulator (Hanau wide-vue, Waterpik, USA). Tentative centric record was used to articulate mandibular cast onto the articulator. The condylar and incisal guidance of the articulator were adjusted to average values of 30 degrees and 7 degrees, respectively. Monoplane occlusal

scheme⁵ was used for mandibular posterior teeth to minimize occlusal loading. Wrought wire clasp-like extensions were provided from the prosthesis on to mandibular left first and second molars for added retention of the prosthesis.

Lingual flange of the provisional mandibular prosthesis were extended medially into the sublingual crescent area and the mylohyoid region to rest under the tongue of the patient. This improved the stability of the prosthesis many folds. During wax up a lip plumper⁶ was added to improve the support for lower lip.

Following acrylisation of the provisional mandibular prosthesis in Heat cure acrylic resin (DPI tuff, Dental Products of India, India), a permanent denture soft liner (Permasoft, Dentsply, India) was placed on the tissue surface of the prosthesis.

CONCLUSION

Management of mandibular defects is one of the most challenging aspects of maxillo-facial prosthetics. These defects affect not only function but also appearance and thus the prosthodontist has to fulfill the dual responsibility of restoring function and appearance.

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