

Modified Neutral Zone Technique for the Partial Mandibulectomy Patient

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ABSTRACT

Aim: Surgical removal of tumors in the mandible leads to discontinuity of bone which requires surgical reconstruction of the defect to provide a suitable tissue foundation for an acceptable prosthesis. At times when reconstructive surgeries are not possible, prosthetic rehabilitation is a successful alternative. In the present article, prosthetic rehabilitation using neutral zone technique has been discussed in the patient of marginal mandibulectomy.

Methods: The fabrication procedure of the removable partial denture was modified to achieve adequate retention and stability in a 22-year-old female patient with the anterior mandibulectomy. Polished surface contours and tooth positioning were recorded with modified neutral zone technique and mandibular teeth were characterized to provide esthetics.

Conclusion: The modified neutral zone technique enhanced the stability of the partial denture. A marked improvement in esthetics, function and psychology was noticed.

Keywords: Ameloblastoma, Mandibulectomy, Neutral zone technique, Prosthetic rehabilitation.

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INTRODUCTION

An ameloblastoma is a fairly common and highly aggressive odontogenic tumor of epithelial origin commonly found in posterior mandible and treated with the surgical excision.¹ The postoperative facial disfigurement and disability associated with a segmental resection of the mandible has been well-documented.²⁻⁵ Consequently, surgeons try to preserve the continuity of the mandible, whenever feasible, by marginal resection of the mandible and in selected patients by bone grafting.^{6,7} In patient with marginal mandibulectomy, defected areas display unusual soft tissue configurations and compromised bone support. Though shorter defects are somewhat easily restored and rehabilitated, but larger defects showing lack of attached mucosa and the obliteration of vestibules may require a vestibuloplasty and skin graft.²

Based on dentition status and tissue configuration, dental implants are used to increase support, stability and retention of prostheses.^{8,9} Implant placements after grafting have been proved to be a good alternative but, in many cases,

this procedure is not possible due to financial issues and inherent fear to surgeries. Removable partial denture may be a preference for patients submitted to marginal mandibulectomy.¹⁰ If a removable partial denture is the selected treatment modality, maximum stability of the partial denture base may be accomplished by a functional impression procedure and by eliminating lateral and horizontal forces caused by the functional movements of the lips, cheeks and tongue. This may be accomplished with use of the neutral zone technique. The neutral zone must be evaluated as an important factor for accomplishing denture stability and retention.² In the present case report, prosthetic rehabilitation of a marginal mandibulectomy patient has been discussed in which a modified neutral zone technique has been used.

CASE REPORT

A 22-year-old female patient was referred to the department of prosthodontics for the replacement of missing mandibular teeth. Marginal mandibular resection was performed for the treatment of ameloblastoma about 5 months back in the department of oral surgery. Extraoral examination demonstrated that the lower lip was unsupported with the deepening of the mentolabial sulcus. Intraoral examination showed the presence of all maxillary teeth and mandibular 37, 46 and 47. The oral pantomogram of the patient showed marginal mandibulectomy along with retained posterior teeth and body of the mandible supported with the plate (Fig. 1). The intermaxillary space in the region of the surgical resection particularly in anterior midmost section was high. Alveolar segment was completely removed in



Fig. 1: Orthopantomogram showing resected mandibular segment



Fig. 2: Intraoral view showing mandibular edentulous segment



Fig. 3: Irreversible hydrocolloid impression of the mandibular arch

this region with tongue muscles directly attached with the lip muscles (Fig. 2). This connection made the rehabilitation prognosis questionable as tongue and the lip movement will directly affect the denture stability in the anterior most regions. However, the contracture obtained due to scar tissues present in this segment was favorable for the successful prognosis as it provided a relatively less movable foundation. Thus, the treatment plan was decided to restore the mandibular missing teeth with a removable partial denture. Patient consent and ethical approval from the ethical committee of the institution was taken before starting the treatment. The polished surface of partial denture in the anterior segment was contoured with the help of neutral zone technique. On the labial aspect, the contours were guided by the lower lip mucosal surface and, on the lingual side, proper space was provided for the tongue movement to ensure no functional impairment.

An impression of the mandible was made with irreversible hydrocolloid impression material (Zelgan, Dentsply India Pvt Ltd, India) using a small plastic tray (usually used for making impression of the mandibular anterior dentulous segment only) with the 5 to 6 mm posterior wax extension added. This small tray was used as an alternative because the lower arch in the anterior region was collapsed due to resection. During impression procedure, tongue was protruded anteriorly to record its functional movement. Thus the impression obtained, duplicated the tongue frenum in continuity with the alveolar bone (Fig. 3). Maxillary impression was made in usual manner with alginate impression material. During jaw relation, posterior stops were provided with modelling wax (Modeling wax no 2, Hindustan Dental Products) to record the vertical relationship. Special care was taken for recording the anterior segment using neutral zone technique with addition silicone putty material (3M ESPE AG, Germany)



Fig. 4: Intraoral view showing contoured putty material using modified neutral zone technique

which was rolled and kept in this region in continuation with the modelling wax support. Then the patient was asked to perform sucking movement and thus the shape obtained, recorded the tentative occlusal space for the correct placement of anterior teeth. Also, the contoured lingual and labial surfaces predicted the polished surface of the denture (Fig. 4). Indexes were made using type II dental plaster. Putty was removed and then wax was poured using plaster indexes as guide. Now the teeth were arranged accordingly with crowding provided, in the anterior region duplicating the crowding of the natural maxillary dentition (Fig. 5). The labial and lingual contours were maintained by using the plaster indexes after removing occlusal portion of the indexes and then again adapted on softened wax portion. Final try-in was done and after taking patient concern the denture was cured in usual manner with heat cured denture base resin. Denture was inserted after finishing and polishing. Follow-up was done after 24 hours, 1 week, one month and after 6 months. Patient was very much satisfied with the esthetic and functional outcome.



Fig. 5: Intraoral view showing post-treatment view

DISCUSSION

In the present case report, alginate impression material was the material of choice as it is easy flowing and records the tissues with minimal pressure application. It is to be noticed that lingual frenum comes in direct contact with base only when in function. Rest of the time, these tissues are at rest leading to less pressure in this region and thus avoiding any harmful effect. As a result, the muscles spare the bone underneath the prosthesis from excessive resorptive forces. The same principle holds true for the lingual extension of any complete mandibular denture.¹¹

The soft tissues that form the internal and external surfaces of the denture greatly affect and influence the stability of the dentures. These tissues also help in determining the peripheral borders, tooth position and external contours of the dentures.¹² The forces developed through muscular contraction during mastication, speaking and swallowing are directed against the dentures.¹³ In the posterior region, there was some alveolar support present, thus this region was used to determine the correct vertical relation of maxilla to the mandible. However, in the anterior region alveolar bone was removed and frenum of the tongue was attached to labial mucosa for maintaining the tongue function which was also responsible for the deepened mentolabial sulcus. In patients with unfavorable edentulous tissue support, the neutral zone impression technique is recommended to register the soft tissue contour and the denture polished surface.¹⁴ Therefore, care was taken to mold the polished surface according to the tongue and labial musculature following the neutral zone concept. Removable partial denture, fabricated using this technique for mandibulectomy patients with anterior edentulous areas is believed to provide support for the lower lip and cheek. It also enhances esthetics by providing proper form and contour to lower facial soft tissues. It will frequently lead

to improved articulation of speech and enhance the control of saliva.² In the case hereby reported, mastication, speech, esthetics, saliva control and facial profile were considerably enhanced. Conventional removable partial dentures for marginal mandibulectomy patients with unusual soft tissue configurations that are constructed using the neutral zone impression technique are able to provide stability, esthetics, function and comfort.¹⁰

During teeth arrangement, special care was taken to crowd mandibular anterior teeth in accordance with natural maxillary dentition. Also because of marginal resection, mesiodistal space in the mandibular anterior region was less, compensation was provided by placing the mandibular canines in buccoversion. The crowding provided in anterior region, served both the functions of duplicating the natural dentition along with proper space management and thus conserving the youth of the patient. To achieve denture stability proper border extensions and impression surface, polished denture surface contours and harmonious occlusion were developed.¹⁵ Though the present case report was treated with removable partial denture placed in a young patient; still the outcome of this treatment could outweigh other factors. Prosthodontic rehabilitation at the earlier stage will reduce the esthetics, functional and social disharmonies in the maxillary or the mandibular resection cases. It has been found that vascularized fibula, iliac crest free flap and radial flap reconstruction with simultaneous placement of osseointegrated implants, represent a successful treatment method for large tumors of the mandible.^{6-9,16} Reconstructive methods follow the principle of what is removed should be either repaired or replaced. Thus if hard tissue is lost, this is generally replaced by hard tissue, such as free bone grafts, vascularized bone or reconstruction plates. If soft tissues are lost, these are replaced by grafts, local or regional flaps or vascularized free tissue transfer. If dental tissues are lost, then these are replaced by dentures or an implant retained prosthesis.¹⁷ Considering the chance to reconstruct the tissues and implant rehabilitation in the future, this type of treatment option is always appreciated in term of restoring the esthetics and functional outcome as well as psychological improvement in tumour resection cases.

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