

REHABILITATION OF MARGINAL MANDIBULECTOMY PATIENT USING NEUTRAL ZONE AND ALTERED CAST TECHNIQUE

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ABSTRACT:

Prosthetic rehabilitation of mandibulectomy patients is challenging because of various anatomical and physiological reasons. In marginal mandibulectomy, even though continuity is preserved, altered soft tissues poses problem in denture placement. Maximum stability of the partial denture base for mandibulectomy patients may be accomplished by the application of the neutral zone concept, which helps in providing stability to the base. This case report describes the fabrication of a removable partial denture for a patient with marginal mandibulectomy using combination of neutral zone technique and altered cast technique. The dentures thus fabricated helped in improving function and esthetic of the patient.

Key Words: Marginal Mandibulectomy, Cast partial denture, Neutral Zone, Altered cast technique.

INTRODUCTION:

Management of malignant tumors associated with tongue, mandible and adjacent structures presents a challenge to the entire team, firstly to control the primary disease and then rehabilitation following resection. Intraoral malignancies often invade mandible and results in its resection in conjunction with large portions of tongue, floor of the mouth and regional lymph nodes. Depending on extent of resection, mandibular defects are grossly divided in to Segmental mandibulectomy, Marginal mandibulectomy and hemimandibulectomy defects. Marginal

mandibuloectomy defects are favorable defects as the continuity of the mandible is maintained thus avoiding deviation of the remnant mandible.

Mandibular defects are more difficult to restore and rehabilitate because of deficient denture bearing area as compared to maxilla. The radical alveolectomy also presents with other challenges to rehabilitation like loss of vertical ridge height and vestibular depth. This can cause a reduction in stability of soft-tissue supported prostheses as well as the loss of load bearing tissues available for support.^[1,2]

Also, mandibular defects lack the soft tissue undercuts as present in maxillary defects which can be used for the retention of the obturator. , there are some situations in which patients suffer from deformity of the lip due to damage of the marginal mandibular branch of the facial nerve. Loss of motor innervation to muscles controlling the lower lip leads to paralysis on the affected side of the mouth.^[3]

This article describes rehabilitation of marginal mandibulectomy patient with a definitive cast partial denture using altered cast technique to improve functions like mastication, speech swallowing as well as facial esthetic.

CASE DETAIL:

A 60 year old patient was referred by an oncologist for rehabilitation of his mandibulectomy defect. The patient underwent marginal mandibular resection on left side extending from left canine to the last molar two years back. Patient had received postsurgical radiotherapy {60Gy in 30 fractions in 45 days duration}. Patient did not show any mandibular deviation, the occlusion of the unresected side was not affected. Mandibular resection site was well healed.

Extraoral examination revealed unsupported lower lip with loss of muscle tone and motor function in the left commissure due to damage of the marginal mandibular branch of the facial nerve. The remaining dentition in mandibular arch was intact with metal crowns on mandibular right first and

second molars (46, 47). The maxillary arch was completely dentulous. (Figure 1 and 2)

Diagnostic impressions of maxillary and mandibular arches were made with irreversible hydrocolloid (Neocolloid, Zhermack, Badia Polesine, Italy) and the casts were obtained. Surveying of the diagnostic cast was done with Neys surveyor to determine favorable undercuts and path of insertion. Cast partial framework was designed. Necessary mouth preparation was carried out as per design consideration. The final impression was made using elastomeric impression material, polyvinyl siloxane (Flaxceed, GC corporation, Tokyo, Japan). This impression was anatomic and gave the maximum extension of the denture bearing area in the resected side. The master cast obtained was surveyed and framework design was finalized.

Design considerations: Patient was having metal crowns on mandibular right first and second molar (46,47). These metal crowns were replaced with the new all metal crowns in which rest seats were carved as per design of the cast partial denture. The rest seats were 1.5 mm deep and 3-4 mm in width to transfer masticatory load as well as avoid lateral force due to musculature on resected side. Ribbon type of occlusal rest was planned on premolars (44,45) to provide extra support as well as to brace premolars during function.

Mandibular plate type of major connector was planned to aid in indirect retention in addition to cingulum rest on the canine

(43). A modified mesh type of minor connector is provided in edentulous areas in which vertical loops were added to support tissue molding material.(Figure 3)

The framework trial was done in patients' mouth. Impression compound (DPI Pinnacle, The Bombay Burmah Trading) and green tracing stick compound (DPI Pinnacle Tracing Sticks, the Bombay Burmah Trading Corporation, Mumbai, India) in the ratio of 3:7 parts by weight were placed in a bowl of water at 65°C and kneaded to a homogenous mass that provides a working time of about 90 seconds. This mix was loaded on the framework in the edentulous area to capture the neutral zone as well as the functional impression of the edentulous area. The patient was asked to perform movements which included talking, swallowing, drinking water, whistling, pursing the lips, pronouncing the vowels, etc to record the neutral zone After 5- 10 minutes, the set impression was removed from the mouth and examined.(Figure 4,5,6)

The master cast was sectioned posterior to the last tooth to separate the edentulous area. This neutral zone functional impression on the framework was seated on the master cast and poured to obtain the altered cast.(Figure 7,8) The index of neutral zone was made using plaster on the master cast over the framework.(Figure 9) Wax rim was fabricated using neutral zone index and teeth were arranged in congruence with neutral zone. Waxed up trial of denture was done in patients' mouth. The

processing of denture was done in usual manner. The finished denture was inserted in patients' mouth and adjusted for occlusal discrepancies. (Figure 10,11)

DISCUSSION:

Prosthetic rehabilitation of mandibular defects is challenging because of altered oral structures, trismus, lack of adequate space, movement due to surrounding musculature, radiation side effects, lack of keratinized mucosa. In marginal mandibulectomy patients, sometimes loss of motor innervations to muscles controlling the lower lip get paralyzed on the affected side of the mouth. In these situations, patients are treated using therapies that induce the regeneration of nerves including nerve grafting, adenosine triphosphate drugs, vitamins, and acupuncture.^[4, 5]

However, nerve regeneration occurs over a long period of time and occasionally may not be adequate or complete. Prosthetic rehabilitation using lip plumper prosthesis is reported. Mukohyama ^[6] used only lip plumper retained by clasps to support paralyzed lower lip while Chakravarthy R ^[7] used magnets to connect lip plumper prosthesis to the partial denture. Pekkan G used modified neutral zone technique for rehabilitation of marginal mandibulectomy defects.^[8]

Neutral zone is the area in the mouth where the forces of the tongue pressing outward are neutralized by the forces of cheeks and lips pressing inward during function.^[9] The internal and external surfaces of the denture greatly affect and

influence the stability of the dentures, and help determining the peripheral borders, tooth position, and external contours of the dentures [10]. The forces developed through muscular contraction during mastication, speaking and swallowing are directed against the dentures [11]

Removable partial dentures fabricated according to the neutral zone technique for mandibulectomy patients with anterior edentulous areas are believed to enhance esthetics and provide support for the lower lip and cheek.[8] It will frequently lead to improved articulation of speech and enhance the control of saliva.[3]

In the present case neutral zone impression technique was used along with cast partial denture. A few modifications were done in conventional class II cast partial denture design to adapt to marginal mandibulectomy patients. Mandibular plate type of major connector was given even though the lingual sulcus depth was more than 8 mm. This ensured contact with hard tissues i.e. teeth thus equilibrating lateral and rotational forces exerted. It also helped in indirect retention.

A ribbon type of occlusal rest also called as continuous rest was provided on premolars. These types of rests are given in periodontally compromised teeth. But in this case it indicated was to splint the weak premolar teeth against pressure exerted by denture. A modified minor connector was used in edentulous area in which vertical loops were added which helped in retaining neutral zone recording

material in place it also helped in recording tissue surface in functional state.

The neutral zone revealed labial bulge in anterior region which was because of paralyzed left corner of the mouth and lower lip. Further processing was done on altered cast. The altered cast technique is widely used in distal extension partial denture to distribute masticatory forces and to compensate differential movement between teeth and tissues. The same concept is applied in this case. Removable partial dentures fabricated using the neutral zone technique for mandibulectomy patients with anterior edentulous areas are believed to enhance esthetics and provide support for the lower lip and cheek.[8] It will frequently lead to improved articulation of speech and enhance the control of saliva [3]. Gürel Pekkan also reported mastication, speech, esthetics, saliva control and facial profile were considerably enhanced with neutral zone technique for marginal mandibulectomy.[8]

Osseointegrated implants [12] and precision attachments [13] can be used for better retention in these patients. These modalities increase the treatment cost considerably, also success rate of implants in radiated jaw bone is less as compared to non-radiated.[14]

In our case esthetic and function of the patient improved significantly. Patient was initially having concern over teeth visibility and restricted movement of lip, but within a week he got adjusted and satisfied.

CONCLUSION:

Prosthetic rehabilitation of marginal mandibulectomy defects with conventional removable partial dentures is difficult because of unusual soft tissue configurations. Combination of cast partial design concept, neutral zone concept and functional impression

concept was done. The outcome of the treatment shows this approach helps to improve function and esthetic of the patient.

REFERENCES:

1. Taylor DT. Diagnostic considerations for prosthodontics rehabilitation of the mandibulectomy patient. In: Taylor TD, editor. *Clinical Maxillofacial Prosthetics*. Illinois: Quintessence Publishing Co Inc; 2000. pp. 155–70.
2. Oelgiesser D, Levin L, Barak S, Schwartz-Arad D. Rehabilitation of an irradiated mandible after mandibular resection using implant/tooth-supported fixed prosthesis: A clinical report. *J Prosthet Dent*. 2004;91:310–4.
3. Beumer J., Marunick MT, Curtis TA, Roumanas E. Acquired defect of the mandible. Beumer J, Curtis TA, Marunick MT. (Eds.), *Maxillofacial rehabilitation: prosthodontic and surgical considerations*, Ishiyaku EuroAmerica, St. Louis (1996), pp. 113–223
4. Jones JK, Van Sickels JE. Facial nerve injuries associated with orthognathic surgery: a review of incidence and management *J Oral Maxillofac Surg*, 49 (1991), pp. 740–744.
5. Choi D., Dunn LT. Facial nerve repair and regeneration: an overview of basic principles for neurosurgeons *Acta Neurochir*, 143 (2001), pp. 107–114
6. Mukohyama H, Kadota C, Ohyama T, Taniguchi H. Lip plumper prosthesis for a patient with a marginal mandibulectomy: a clinical report. *J Prosthet Dent*. 2004 ;92(1):23-6.
7. Chakravarthy R. Magnet Retained Sectional Lip Plumper Prosthesis for A Patient With Hemi-Mandibulectomy: A Clinical Report. *J Clin Diagn Res*. 2010;(4):2582-6.
8. Pekkan G, Hekimoglu C, Sahin N. Rehabilitation of a marginal mandibulectomy patient using a modified neutral zone technique: a case report. *Braz Dent J*. 2007; 18(1):83-6.
9. Wee AG, Cwynar RB, Cheng AC. Utilization of the neutral zone technique for a maxillofacial patient. *J Prosthodont* 2000;9:2-7.
10. Gahan MJ, Walmsley AD. The neutral zone impression revisited. *Br Dent J* 2005;198:269-72.
11. Makzoume JE. Morphologic comparison of two neutral zone

impression techniques: a pilot study.
J Prosthet Dent 2004;92:563-568.

12. Chao YL, Lin L, Wang TM. Mandibular Rehabilitation with Dental Implants: A case report. J Prostho Implant 2012;1(2): 53-59.
13. Jain V, Mundhe K, Pruthi G. Prosthodontic rehabilitation of patient with marginal mandibular

resection using attachment supported prostheses: A clinical report. Contemp Clin Dent 2014; 5(1):123-26.

14. Dholam KP, Gurav SV. Dental Implants in irradiated jaws - A literature review. J Cancer Res Ther. 2012; 8(6): 85-93.

FIGURES:



Figure 1: Pre treatment extraoral view of patient

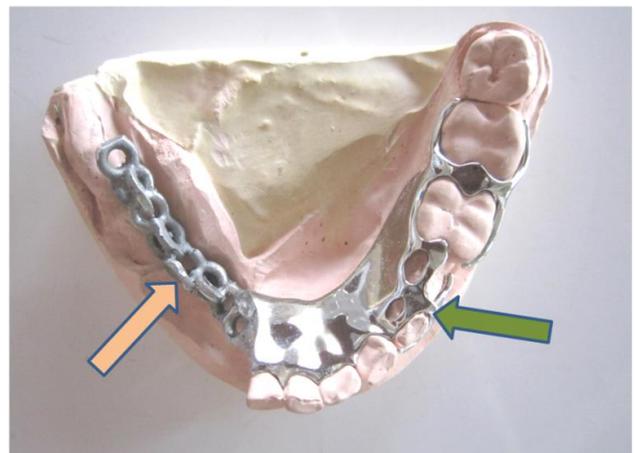


Figure 3: Cast partial denture framework
note: Ribbon rest and Modified minor Connector



Figure 2: OPG Showing marginal mandibulectomy



Figure 4: Recording Neutral zone by various movements



Figure 5: Recording neutral zone introral view



Figure 6: Neutral zone record

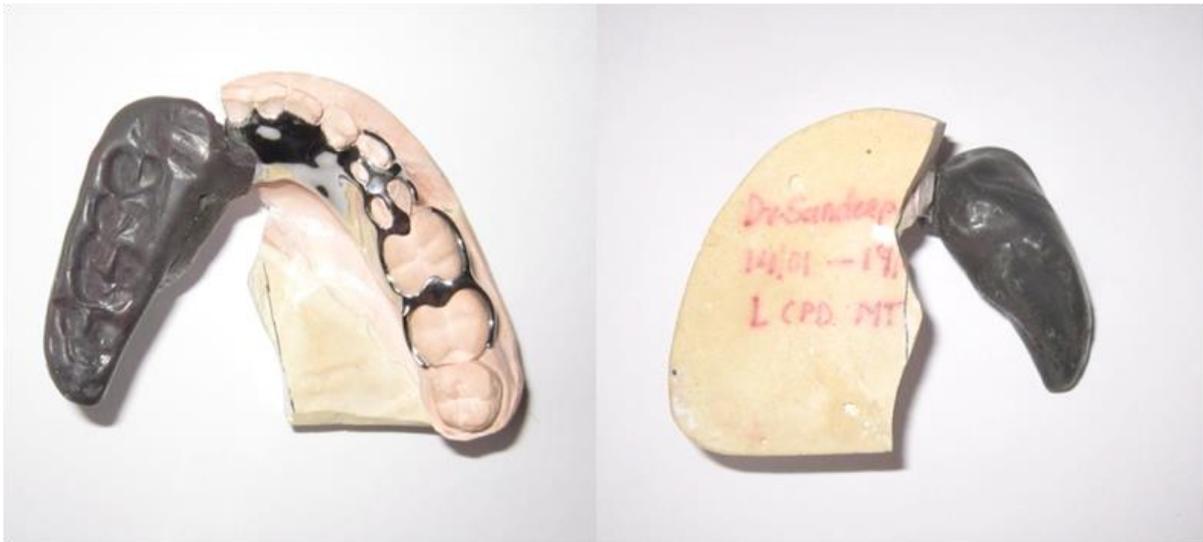


Figure 7: Altered cast preparation



Figure 8: Altered cast



Figure 9: Neutral Zone index made in type II gypsum- dental plaster



Figure 10: Occlusal and intaglio surface of the final denture



Figure 11: Final denture in the mouth – Post treatment