

Prosthetic management of hemimandibulectomy patient with guiding plane and twin occlusion prosthesis

Pavankumar R. Koralakunte,
Sunitha N. Shamnur¹,
Rudraprasad V. Iynalli¹,
Shadakshari Shivmurthy¹

Department of Prosthetic Dental Sciences, College of Dentistry, Hail University, Kingdom of Saudi Arabia, ¹Department of Maxillofacial Prosthodontics, Bapuji Dental College and Hospital, Davangere, Karnataka, India

Address for correspondence:

Dr. Pavankumar R. Koralakunte, Department of Prosthetic Dental Sciences, College of Dentistry, Hail University, Kingdom of Saudi Arabia. E-mail: pavan_dent@yahoo.co.in

Abstract

Mandibular deviation is multifactorial defect and its severity is based on the extent of osseous and soft tissue involvement, degree of tongue impaired, the loss of sensory and motor innervations, the type of wound closure, the presence of remaining natural teeth and finally the first initiation of prosthetic treatment. We describe a case of prosthetic management of a maxillary partially edentulous patient with hemimandibulectomy who reported after 4 years of postsurgical cancer therapy. A simple maxillary guided hollow inclined plane with twin occlusion acrylic prosthesis was fabricated as a functional training device to correct mandibular deviation, restore maxillomandibular relation and occlusal approximation. The patient was able to functionally achieve good maxillomandibular occlusal approximation with guidance therapy combined with physiotherapy in 2 weeks. A 6 months follow-up revealed patient satisfactory appreciation by understanding the limitations of overall prosthetic rehabilitation.

Key words: Guiding plane, hemimandibulectomy, inclined plane, neutral zone, prosthodontic rehabilitation, twin occlusion

INTRODUCTION

The prosthodontic rehabilitation of patients with mandibular defects is challenging. The unilateral loss of mandibular continuity due to surgery or trauma results in mandibular deviation toward the defect side with lack of occlusion. Unlike the dentulous patients, edentulous patients are difficult to restrain mandibular movement and many times may never achieve proper maxillomandibular relationships for optimum mastication and appearance.^[1] We present a case of a partially edentulous hemimandibulectomy patient who approached for replacement of missing teeth after 4 years of cancer therapy. Initial evaluation of considering prosthetic management indicated poor prognosis. However, the patient's positive mental attitude toward treatment along with the application of basic fundamental principles by the prosthodontist during treatment procedure led us to fabricate a simple, effective functioning prosthesis that showed positive satisfactory prosthetic results.

CASE REPORT

A 55-year-old female patient with maxillary unilateral partially edentulous reported to the Department of

Maxillofacial Prosthodontics, Bapuji Dental College and Hospital, Karnataka, India with the complaint of having difficulty in eating and speaking due to loss of teeth. The patient gave history of pain and swelling on lower left side of the jaw 4 years back, diagnosed as moderately differentiated squamous cell carcinoma of left mandibular alveolus involving the ramus due to chronic tobacco chewing since 40 years. The medical history revealed that the patient was surgically operated 4 years back by a wide resection of the tumor with left hemimandibulectomy without disarticulation, left radical neck dissection and reconstruction with pectoralis major myocutaneous flap. Extraoral examination indicated facial asymmetry and a convex profile with deviation of mandible to the left side [Figure 1]. Past dental history revealed extraction of periodontally weakened maxillary teeth from 11, 21 to 27. Intraoral examination revealed maxillary Kennedy's class II partially edentulous arch with missing teeth from 11, 21 to 27 and on palpation, the absence of mandibular ridge from left canine region posteriorly with missing teeth 33 to 37. Clinical examination of the surgical wound closure showed consolidated cicatricial tissues [Figure 2], the remaining natural teeth in both arches were attrited with slight loss of periodontal support.

An orthopantomogram radiograph revealed resected mandible distal to left canine involving entire mandible of left side without condylectomy [Figure 3] representing class II type postsurgical impairment according to Cantor and Curtis classification,^[2] which was determined by prosthetic considerations.

The surgical and implant reconstruction of the defect were suggested as choice of treatment; however, the patient refused any further surgical intervention due to poor socioeconomic status. Hence, the patients mandible was manually guided into centric occlusion without excessive force [Figure 4] and a treatment was planned for fabricating maxillary acrylic guided inclined plane with twin occlusion prosthesis to meet the need of the patient opposing mandibular acrylic partial denture.

PROCEDURE

The preliminary impressions were made with irreversible hydrocolloid for the maxillary arch and polyvinyl siloxane of putty viscosity for the mandibular arch to obtain primary casts from Type II dental plaster for acrylic custom trays construction. Secondary rubber base impressions were made after border molding with

Type II compound to obtain master casts from Type III dental stone. The self-cure acrylic resin denture base with wax occlusal rims constructed on master casts was used to record jaw relation. The articulation was done on a semi adjustable articulator followed by recording the neutral zone using tissue conditioning material (Visco gel) by functional method. A putty index was made surrounding the neutral zone. The tissue conditioner was then replaced with modeling wax for arrangement of mandibular and maxillary nonanatomic acrylic teeth in the neutral zone area. Tryin was completed with a wax ramp made on the right palatal half surface adjacent to the posterior teeth and double rows of posterior teeth was placed on the left palatal surface that guided the deviated mandible into occlusion. Following dewaxing, a hollow acrylic inclined plane was created using lost salt technique to lighten the weight of the prosthesis. For retention purpose, a 22 gauge orthodontic wire was used for maxillary prosthesis that followed the contour of buccal teeth surfaces below the height of contour and the mandibular acrylic prosthesis was retained by bobby pins encircling the remaining teeth. After processing, finished and polished heat cure acrylic maxillary guided inclined plane prosthesis (hollow acrylic ramp) with twin occlusion (double rows of acrylic teeth) [Figure 5] and



Figure 1: Frontal view showing deviated mandible toward defect



Figure 2: Intraoral view showing scar tissue



Figure 3: Orthopantomogram showing the left mandibular defect



Figure 4: Patient able to guide the deviated mandible into occlusion

mandibular acrylic prosthesis [Figure 6] were inserted. Postinsertion, the patient, was advised not to masticate on the side of the defect. The patient was first trained with the guided prosthesis [Figure 7] after its insertion to get accustomed. Follow-up evaluation every 3-6 months showed functional and psychological patient satisfaction [Figure 8].

DISCUSSION

The reasons for segmented resected mandible are multifactorial^[1,3-5] with several collateral problems which alter prosthetic prognosis.^[5-7] However, the four significant factors that affect the amount of prosthetic rehabilitation include the site and extent of surgery, the effect of radiation, presence or absence of teeth and psychological impact.^[8] The basic objective of rehabilitation is retraining the remaining mandibular muscles to stabilize the mandibular denture by providing an acceptable maxilla-mandibular relationship of the remaining portion of the mandible with repeated occlusal

approximation in restoring occlusal function.^[9] Many patients need the additional support of a maxillary inclined plane prosthesis to assist muscle retraining as fabricated in the present case that acts as guiding or training device. The retraining of the residual mandibular muscles would permit occlusion of remaining natural teeth or control of residual edentulous segments to provide for the reasonable placement and acceptable occlusion of the artificial teeth.^[9]

When surgical reconstruction following mandibulectomy is not feasible, various prosthesis are used to reduce or eliminate mandibular deviation.^[4,6,9-14] In the present case, a maxillary acrylic inclined guiding plane prosthesis was fabricated to assist muscle retraining as acrylic allows for some adjustments when the relationship improves in positioning the mandible. This inclined plane prosthesis is generally indicated for those patients who are edentulous in the maxillary arch only and who have anatomic contours that permit good border seal and a stable maxillary prosthesis similar to the case presented.^[9] In order to reduce the weight of the maxillary inclined



Figure 5: Maxillary guided inclined plane with twin occlusion acrylic prosthesis



Figure 6: Mandibular acrylic prosthesis with retentive bobby pins



Figure 7: Patient learning with guided prosthesis after insertion



Figure 8: Satisfied patient with the prosthesis

prosthesis, it was made hollow similar to a hollow obturator fabricated using lost salt technique.^[15] In the present case, the patient had difficulty in attaining the ideal mediolateral position of the remaining residual segment. To attain acceptable occlusal contacts with the remaining natural teeth on unresected side, a flat, wide twin maxillary occlusal table on resected side was made to compensate for the deviation that can provide a surface against which the artificial teeth of the residual segment can occlude. This surface can be inclined to better occlusal relationship. By providing freedom in lateral movements, it minimizes lateral forces and enhances stability of the mandibular prosthesis. A Monson curve was incorporated to orient the mandibular segment by deflecting it outward. The teeth slide over one another down the incline made by the second row of teeth for achieving a functional occlusal position. The inner row helped in restoring the function whereas the outer row supported the cheeks enhancing the esthetics.^[5,10,13]

The tissue in the surgical region is scarred, uneven, unsupported by bone and movable in various degrees. These features make the area unsuitable to be covered by an appliance or to receive loading.^[16] In the present case, a maxillary guiding prosthesis occluded with opposing mandibular partial acrylic prosthesis that cover only remaining denture bearing area of the mandible. The patients tolerated these simple uncomplicated prosthesis well and adapted very easily to guide the mandible to functional approximation. Its ease of use helps patients in retraining the muscles and learning to masticate with the prosthesis after a short period of accommodation.^[10] The discontinuity defect involves the problem of either accepting the postsurgical mandibular position or attempting to retrain the mandibular muscles to control the mediolateral position of the mandible to achieve an acceptable occlusal interdigitation. In either situations, opposing occluding surfaces of some type can be provided. But occlusal efficiency and limitations in prosthodontic management must be considered.^[9] In the present case, acrylic teeth with flat occlusals were provided limiting occlusal efficiency.

Following resection of the mandible, the part of the bony mandible and teeth that remains has to articulate with normal structures of the maxilla. When a part of mandible is resected, the movements of mandible in the functional range and occlusal proprioception differ from that of movements and occlusion of the normal mandible as the residual segment will retrude and deviate toward the surgical site. During mastication, entire envelope of motion occurs on surgical defect side.^[17] The frontal plane rotation occurs due to loss of proprioceptive

sense of occlusion, which leads to uncoordinated and less precise movement of the mandible. Also, due to attachment loss of muscles of mastication on surgical side, there is significant rotation of the mandible upon forceful closure. When the force of closure increases, the residual mandible actually rotates through the frontal plane.^[11] The primary cause for abnormal position of the mandible may be due to the action of suprahyoid muscle and uncompensated influence of contralateral internal pterygoid muscle.^[12,17]

In the present case, physiotherapy was suggested to assist the patient in improving the symmetrical arc of closure and finding centric occlusion position without guiding her mandible manually. The exercises consisted of simple opening and closing of the mandible with and without the prosthesis. After 1-week postinsertion, the patient was able to close the mandible in functional maxillomandibular occlusion position without manual assistance. However, for optimum results, the guidance prostheses should be combined with an organised exercise program that can be started 2 weeks postsurgically and consists of the patient grasping the chin and moving the mandible away from the surgical side.^[4,11,18] The occlusion can only be developed in these patients with the use of static centric position record rather than a truly repeatable centric relation but is reasonable. The position might be subject to change at a later date if mandibular control ability improves or differs.^[9] If guidance therapy is successful and the patient can achieve intercuspal position, efficient mastication may still not be possible for patients with compromised tongue mobility and control.^[11] In the present case, the partially edentulous patient had weak remaining natural teeth and since the deviation was present for a long duration of 4 years, a simple removable acrylic partial denture with guided inclined plane was fabricated rather than a removable cast partial denture flange prosthesis. A combined guided hollow inclined plane with twin occlusion prosthesis was fabricated which performed dual functions. On the unoperated side, the prosthesis guided mandible into a functional occlusion and on the operated side, the prosthesis contacted with the mandibular partial denture to provide mandibular stability.

In discontinuity defects, not only there is a loss of bone support, but surgical closure prevents the residual structures from being used for prosthesis support and extension.^[19] To improve stability and retention, neutral zone need to be recorded. In the present case, tissue conditioner was used as a functional impression to improve tissue bearing surface of the mandibular denture. The functional impression technique was advocated because the dynamic adaptive stress promotes

a condition and a contour of the denture base mucosa that is compatible with denture function. The tissue conditioner was also used to record neutral zone after jaw relation was completed where the patient occludes in the centric position and performs functional movements for 5-10 min.^[19-22] Teeth are arranged in neutral zone that is muscularly balanced and delivered to the patient followed by curing with rebasing.^[20,22]

The mandibulectomy patient is difficult to manage because the prosthodontist is limited in his ability to provide a reasonable and practical occlusal scheme. However, these patients need the definitive clinical and psychological support of the prosthodontist.^[9] The timing of the maxillofacial prosthodontist's initial contact with these patients before surgery is very important for proper examination, planning and execution so that the training prosthesis can be inserted at the time of surgery or shortly later to prevent muscle imbalance from pulling the mandible to an eccentric position and decrease the effect of pull from the contraction of the cicatricial tissue.^[6]

CONCLUSION

The need for early consultation with the maxillofacial prosthodontist has been emphasized in rehabilitation of mandibulectomy patients. A multidisciplinary team approach before, during and after surgery for better prosthodontic treatment outcome is important along with early guidance therapy, individualized physiotherapy and patient cooperation. The present article describes the fabrication of a maxillary guided hollow inclined plane with twin occlusion prosthesis to guide the segmented mandible into its most acceptable functional position after long-term scarring and mandibular deviation to the affected side. The positive mental attitude of the patient towards the treatment with assisted physiotherapy led to overcoming the limitations of prosthetic rehabilitation giving satisfactory results.

REFERENCES

1. Schneider RL, Taylor TD. Mandibular resection guidance prostheses: A literature review. *J Prosthet Dent* 1986;55:84-6.
2. Firtell DN, Curtis TA. Removable partial denture design for the mandibular resection patient. *J Prosthet Dent* 1982;48:437-43.
3. The glossary of prosthodontic terms. *J Prosthet Dent* 2005;94:10-92.
4. Sahin N, Hekimoglu C, Aslan Y. The fabrication of cast metal guidance flange prostheses for a patient with

segmental mandibulectomy: A clinical report. *J Prosthet Dent* 2005;93:217-20.

5. Prakash V. Prosthetic rehabilitation of edentulous mandibulectomy patient: A clinical report. *Indian J Dent Res* 2008;19:257-60.
6. Moore DJ, Mitchell DL. Rehabilitating dentulous hemimandibulectomy patients. *J Prosthet Dent* 1976;35:202-6.
7. Cantor R, Curtis TA. Prosthetic management of edentulous mandibulectomy patients. I. Anatomic, physiologic, and psychologic considerations. *J Prosthet Dent* 1971;25:446-57.
8. Curtis TA, Cantor R. The forgotten patient in maxillofacial prosthetics. *J Prosthet Dent* 1974;31:662-80.
9. Desjardins RP. Occlusal considerations for the partial mandibulectomy patient. *J Prosthet Dent* 1979;41:308-15.
10. Swoope CC. Prosthetic management of resected edentulous mandibles. *J Prosthet Dent* 1969;21:197-202.
11. Beumer J 3rd, Curtis TA, Marunick MT, editors. *Maxillofacial Rehabilitation: Prosthodontic and Surgical Consideration*. St. Louis: Ishiyaku EuroAmerica; 1996. p. 184-8.
12. Robinson JE, Rubright WC. Use of a guide plane for maintaining the residual fragment in partial or hemi mandibulectomy. *J Prosthet Dent* 1964;14:992-9.
13. Agarwal S, Praveen G, Agarwal SK, Sharma S. Twin occlusion: A solution to rehabilitate hemimandibulectomy patient — A case report. *J Indian Prosthodont Soc* 2011;11:254-7.
14. Aruna U, Thulasingham C. Prosthodontic management of segmental mandibulectomy patient with guidance appliance and overlay denture. *J Indian Prosthodont Soc* 2013;13:593-9.
15. Minsley GE, Nelson DR, Rothenberger SL. An alternative method for fabrication of a closed hollow obturator. *J Prosthet Dent* 1986;55:485-90.
16. Rosenthal LE. The edentulous patient with jaw defects. *Dent Clin North Am* 1964;8:773-9.
17. Curtis TA, Taylor RC, Rositano SA. Physical problems in obtaining records of the maxillofacial patient. *J Prosthet Dent* 1975;34:539-54.
18. Beumer J, Curtis TA, Firtell DN, editors. *Maxillofacial Rehabilitation: Prosthodontic and Surgical Considerations*. St. Louis: Mosby; 1979. p. 150-6.
19. Shifman A, Lepley JB. Prosthodontic management of postsurgical soft tissue deformities associated with marginal mandibulectomy. Part I: Loss of the vestibule. *J Prosthet Dent* 1982;48:178-83.
20. Chaney S. Denture stability for partial mandibular resection patients. *J Prosthet Dent* 1983;49:77-9.
21. Kursoglu P, Ari N, Calikkocaoglu S. Using tissue conditioner material in neutral zone technique. *N Y State Dent J* 2007;73:40-2.
22. Gahan MJ, Walmsley AD. The neutral zone impression revisited. *Br Dent J* 2005;198:269-72.

How to cite this article: Korlakunte PR, Shamnur SN, lynalli RV, Shivmurthy S. Prosthetic management of hemimandibulectomy patient with guiding plane and twin occlusion prosthesis. *J Nat Sc Biol Med* 2015;6:449-53.

Source of Support: Nil. **Conflict of Interest:** None declared.

Access this article online

Quick Response Code:	Website: www.jnsbm.org
	DOI: 10.4103/0976-9668.160036