Journal of Nepal Dental Association (2010), Vol. 11, No. 2, Jul.-Dec., 186-188

Case Note

Neutral zone technique in prosthetic rehabilitation of hemi-mandibulectomy patients: An alternative approach

Prakash A[1], Shenoy VK[2], Prashanti E[3], Jain N[4]

[1]Faculty of Dentistry, Meleka Manipal Medical College, Manipal, [2]Professor and Head, [3,4]Assistant Professor, Department of Prosthodontics, Manipal College of Dental Sciences, Mangalore.

Abstract

One of the most demanding of the maxillofacial endeavors is the construction of a functional removable denture for the patient who has undergone a mandibular resection. All the disciplines of scientific denture construction must be mastered to afford satisfactory rehabilitation in such cases. This article describes the management of a partially edentulous hemi- mandibulectomy patient using the neutral zone concept.

Key words: Mandibular resection, Denture stability, Zone of equilibrium

Introduction

Many debilitating problems often affect persons who have had hemi-mandibulectomy. The problems include occlusion in an eccentric position because of the movement of the mandible toward the resected side, changes in their normal masticatory cycle, facial disfigurement, an alteration of speech, and problems with salivation due to lack of support and innervation[1]. Several factors need to be evaluated in order to achieve successful prosthetic treatment for these patients (Table 1)[2].

Achieving retention and stability for hemi-mandibulectomy patients becomes a challenging task. Some prosthodontists stress the role of saliva and related physical factors, such as cohesion, adhesion, viscosity, and surface tension that contribute to retention[3-6].

Others stress on the physiologic approach, and insist that the muscular dynamics of the oral cavity are a primary source of retention[7-9]. The physiologic concepts of functional retention and stability have relevance to mandibulectomy patients. The contra lateral antagonistic forces of the normal musculature on one side of the oral cavity functioning against the postsurgical scar tissue on the defect side are a source of active scar-muscular fixation. Flaccid tissues that result from disuse atrophy or disruption of neuromuscular control can also contribute to denture retention by means of passive muscular fixation[2].

The neutral zone technique is an alternative approach for these complex cases. The technique is not new but is one that is valuable and needs a thorough knowledge about tissue anatomy and muscle function. This article describes successful application of neutral zone concept in the management of a partially edentulous hemi-mandibulectomy patient.

Clinical report

A 52 year old partially edentulous male patient was referred to the Department of Prosthodontics, Manipal College of Dental Sciences, Mangalore with the chief complaint of difficulty in eating and speaking.

History revealed that the patient was diagnosed with squamous cell carcinoma of the right mandible for which wide excision of the lesion was performed resulting in a class IV mandibular defect[10, 11] (Table 2). The resection involved the anterior and lateral aspect of the mandible and was augmented to maintain pseudo articulation of bone and soft tissue in the region of the ascending ramus.

Clinical examination revealed the presence of thick soft tissue with scar formation, the presence of freely movable soft tissues, the loss of alveolar ridge, and the loss of buccal and lingual sulcus in the right mandibular region. The teeth present in the mandibular arch were 38 and the teeth absent in the maxillary arch were 14,

Correspondence

Dr. Vidya K Shenoy, Professor and Head, Department of Prosthodontics, Manipal College of Dental Sciences, Light House Hill Road, Mangalore, E-mail: vidsks@rediffmail. com

16, 22, 26 and 27. It was noted that the mandibular deviation in this patient was very minimal. However, the tooth support in the mandibular arch was limited and the denture foundation was unfavorable, due to which a neutral zone technique involving the philosophy of muscle balance for denture stability was selected as a treatment of choice. Initially an interim acrylic partial denture was planned, to assess the stability as well as to train the patient to effectively function with the dentures.

Diagnostic casts were prepared from preliminary impressions which were made with irreversible hydrocolloid (Zelgan 2002, Dentsply, Haryana, India). Self polymerized acrylic resin custom trays (DPI, Mumbai,India) were constructed. The tray was border molded with modeling plastic (DPI Tracing stick, Dental products of India, Mumbai, India), taking care to avoid over extension. Final impression was made with medium body poly vinyl siloxane (Reprosil, Dentsply/caulk, Milford, DE). This impression material was chosen to produce minimal tissue displacement. Master casts were poured with type III dental stone (DPI, Mumbai, India). On the mandibular master cast a permanent denture base (Heat polymerized acrylic resin, DPI, Mumbai, India) with retentive pins was fabricated. These pins aided in the retention of the low fusing compound used in recording the neutral zone.

During Jaw relations the low fusing compound, was kneaded and placed on the mandibular permanent denture base. The patient was instructed to swallow and then purse the lips as in sucking. Various functional activities like smiling, whistling, licking the lips and grinning were also made by the patient to functionally mold the low fusing compound. Mandibular occlusal plane was established from the corner of the mouth to two thirds fo retro molar pad. The low fusing compound was softened and the functional movements were repeated until the denture base remained stable.

To test the stability of the lower record base the patient was asked to open the mouth wide, wet the lips with the tongue, count from one to ten and say exaggerated “oohs”, “ahs” and “ees”. During all these movements the denture base remained stable ensuring that the neutral zone was established. Jaw relations were recorded and mounted onto the articulator. To preserve the established neutral zone an index was made using poly vinyl siloxane of putty consistency (Reprosil, Dentsply/caulk, Milford, DE). The retentive pins on the permanent denture base was removed and the low fusing compound was replaced with modeling wax (Hindustan Modelling Wax, The Hindustan Dental Products, Hyderabad, India) on which teeth arrangement was done using semi-anatomic posterior teeth (Premadent, Super Dental Products, New Delhi, India). The wax set up was tried in the mouth and was checked for phonetics and occlusion. It was re-confirmed that the mandibular denture base was stable in the mouth on performing the various functional movements.

The maxillary and mandibular dentures were processed using heat polymerized acrylic resin (DPI, Mumbai, India). The dentures were inserted and interfering contacts on the denture teeth were corrected. Drastic improvement in the stability of the prosthesis was observed. Post insertion instructions were given and the patient was motivated to make efforts to learn to adapt to the new dentures. Follow-up of the patient was done at one month, three months and six months interval. The patient reported with satisfactory esthetics, mastication and phonetics.

Table 1: Evaluation factors for partial mandibulectomy patient (edentulous)

1. Preoperative success with dentures
2. Over-all vigor of patient
3. Patient awareness of present oral status and limitations
4. Amount of mandible remaining
5. Amount of deviation
6. Remaining kinesthetic sense and control
7. Actual present ridge relationship
8. Nature of denture-bearing area
9. Type of treatment patient has received
10. Status of the patient’s disease

Table 2: Cantor and Curtis Classification (1971)

Class I:	Mandibular resection involving alveolar defect with preservation of mandibular continuity
Class II:	Resection defects involve loss of mandibular continuity distal to the canine area
Class III:	Resection defect involves loss up to the mandibular midline region
Class IV:	Resection defect involves the lateral aspect of the mandible, but are augmented to maintain pseudo articulation of bone and soft tissues in the region of ascending ramus.
Class V:	Resection defect involves the symphysis and para symphysis region only, augmented to preserve bilateral temporomandibular articulations.
Class VI:	Similar to class V, except that the mandibular continuity is not restored

Discussion

The primary objective of denture fabrication is to construct dentures that will satisfy the three basic requirements of maximum comfort, functional efficiency and esthetics.

Segmental resection of the mandible often leaves the denture bearing area unfavorable to receive an ideal prosthesis. In such conditions, variations in techniques have to be employed to achieve adequate stability of the denture[12]. The co-ordination of neuromuscular function with the prosthesis is the foundation for successful stable dentures. The neutral zone is that area in the mouth where, during function the forces of the tongue pressing outward are neutralized by the forces of the cheeks and lips pressing inward[13].

The neutral zone technique is most effective for patients with history of unstable, non-retentive lower dentures, patients with partial glossectomy, mandibular resections or motor nerve damage to the tongue, which have led to either atypical movement or an unfavorable denture bearing area.

Conclusion

Dentures are primarily mechanical devices, but since they function in the oral cavity, they must be fashioned so that they are in harmony with normal neuromuscular function. All oral functions involve the synergistic actions of the tongue, lips, cheeks, and floor of the mouth which are very complex and highly individual. Failure to recognize the cardinal importance of tooth position and flange form and contour often results in dentures which are unstable and unsatisfactory, especially in compromised cases like the mandibular resection patients. In the present case report, the neutral zone technique proved to be an effective treatment option in achieving adequate stability of the denture in the hemi-mandibulectomy patient.

References

1. Moore D J, Mitchell D. Rehabilitating dentulous hemi mandibulectomy patients. J. Prosthet. Dent. 1976; 35(2):202-06.
2. Schaaf N G. Oral reconstruction for edentulous patients after partial mandibulectomies. J Prosthet. Dent 1976; 36(3): 292-97.
3. Craig, R. G. , Berry, G. C., and Peyton, F. A. Physical Factors Related to Denture Retention, J. Prosthet Dent 1960; 10: 459-67.
4. Campbell, R. L. Some Clinical Observations Regarding the Role of the Fluid Film in the Retention of Dentures, J Am Dent Assoc 1954; 48: 58-63.
5. Skinner, E. W. , and Chung, P. Effect of Surface Contact in the Retention of a Denture, J. Prosthet Dent 1951; 1: 229-35.
6. Kabcenell, J. L. More Retentive Complete Dentures, J Am Dent Assoc. 1970; 80: 116-20.
7. Merkeley, H. J. Lower Denture Technique Based on a Proper Understanding of the Accessory Muscles of Mastication, J. Am Dent Assoc. 1957; 54: 769-82.
8. Lott, F. , and Levin, B. Flange Technique: An Anatomic and Physiologic Approach to Increased Retention, Function, Comfort, and Appearance of Dentures, J. Prosthet Dent. 1966; 16: 394-413.
9. Gahan M J, Walmsley A D. Neutral zone impression revisited. Br Dent J 2005; 198(5): 269-72
10. Cantor R, Curtis TA. Prosthetic management of edentulous mandibulectomy patient. I. Anatomic, physiologic, and psychologic considerations. J Prosthet Dent 1971; 25: 446-57.
11. Fonsica R J, Davis W H. Reconstruction preprosthetic oral and Maxillofacial surgery, 2nd ed. WB Saunders Company : pg 1063-67
12. Beumer J 3rd, Curtis TA, Marunick MT. Maxillofacial rehabilitation: prosthodontic and surgical considerations. 1st ed. St Louis (MO): Ishiyaku EuroAmerica, Inc; 1996. p. 202-6.
13. Beresin V E, Schiesser F J. The neutral zone in complete dentures. J Prosthet Dent 1976; 36: 356-67.