NEUTRAL ZONE FOR FABRICATION OF COMPLETE DENTURES IN A HEMIMANDIBULECTOMY PATIENT: A CASE REPORT

Manchikalapudi Githanjali*, Hegde Veena**

The altered anatomy and neuromuscular control makes rehabilitation of an edentulous hemimandibulectomy patient a clinical challenge and denture stability is extremely difficult to achieve. Describes prosthetic rehabilitation of an edentulous hemimandibulectomy patient with complete dentures, incorporating a maxillary posterior occlusal ramp to guide and support the deviated residual mandibular fragment and a neutral zone record to determine the tooth position and final denture form for a stable mandibular denture. A neutral zone record is a useful clinical tool in determining the tooth position and contouring the polished surface of the mandibular denture. It can overcome denture stability difficulties in patients with altered anatomy and neuromuscular control.

Key Words: Denture, complete, lowerJaw, edentulous / rehabilitation Mandible / surgery, Mandibular prosthesis.

One of the consistently challenging areas of maxillofacial rehabilitation is the treatment of patients who have had mandibulectomy and commando procedures that involve loss of tissues and associated function.[1]

Extensive loss of soft tissue, loss of bone support, and surgical closure prevent prosthesis support and extension. In a discontinuity defect, the most common postoperative rehabilitative problem is lack of occlusion, secondary to mandibular deviation.[2]

A provisional guide plane facilitates construction of a nearly perfect functioning permanent restoration in a dentulous patient,[3,4] whereas intermaxillary fixation immediately after segmental resection of mandible,[5] and palatal based guidance restorations like maxillary ramp or occlusal table[5,6] are advocated in rehabilitation of an edentulous patient. For optimum results these prosthesis should be combined with an organized exercise program.[8]

Another consequence of surgical resection is altered neutral zone and neuromuscular control that make mandibular complete denture construction challenging.[9] The physiologic concept of functional retention and stability has relevance to mandibulectomy patient.1 Neutral zone concept to record potential denture space and harness functional retention potential for a stable mandibular prosthesis has been advocated.[9-13]

Preprosthetic reconstructive surgery and implant supported over dentures are alternate treatment options.

This article describes the fabrication of complete dentures for a completely edentulous patient who had undergone hemimandibulectomy, incorporating the maxillary ramps to guide the deviated mandibular fragment and the neutral zone record to determine the tooth position and final denture form.

CASE REPORT

A 77 year old completely edentulous male patient presented with hemimandibulectomy and mandibular deviation to the left.

The patient diagnosed with proliferative verucous leukoplakia of the left mandible underwent Wide excision of the lesion (including left hemimandibulectomy and neck dissection) with sternomastoid flap reconstruction 3 months before

*Senior Lecturer, Department of Prosthodontics, Army College of Dental sciences, Secunderabad , A.P.
**Professor and Head, Department of Prosthodontics and Maxillofacial Prosthetics, Manipal College of Dental Sciences, Manipal, Karnataka.

presentation. The patient reported 10 year edentulous period prior to surgery and was not a denture wearer (Figs. 1,2)

Clinical examination revealed deviation of the mandible to the left, decreased vertical dimension, normal deglutition, impaired speech, restricted tongue movements and drooling of saliva.

Surgical reconstruction of the defect and implant assisted over dentures were suggested as treatment of choice. However, the patient refused any further surgical intervention because of financial constraints and fear of surgery. It was decided that conventional complete dentures would be fabricated.

Preliminary impressions made in irreversible hydrocolloid (Imprint,DPI Ltd.,Mumbai, India) were used to fabricate diagnostic casts and acrylic custom trays (DPI-RR cold cure, DPI Ltd.,Mumbai). The custom trays were border molded with green stick compound and final impressions made with zinc oxide eugenol impression paste for the upper arch and medium body polyvinyl siloxane impression material for the lower arch (Reprosil, Dentsply-caulk, Milford, DE). Centric relation and vertical dimension were recorded and master casts mounted on a mean value articulator.

Recording the neutral zone

Three resin columns extending towards the maxillary ridge were constructed on the mandibular record base (Fig 3). Acrylic resin columns were then modified with modeling compound stops at the established vertical dimension. The extensions of record base were assessed intraorally (Fig. 4) and soft putty (Affinis super soft putty, Coltene/ Whaledent Inc,) used to record the neutral zone. Patient was instructed to carry out simple oral movements, such as swallowing, puffing of cheeks and sucking in of lips while keeping the ridge and modeling compound stops in contact. This permitted the buccal and lingual oral musculature to shape the soft putty on the record base to the contours of neutral zone (Fig 5). The record base with the neutral zone record was then removed, disinfected and transferred to the mandibular master cast. An index was made by adapting putty on buccal, labial and lingual aspects of the neutral zone record. The neutral zone record along with the impression compound stops was removed from the mandibular record base. The putty index was repositioned on to the record base, sealed with sticky wax and molten wax poured into it (Fig.6). The wax rim so obtained duplicates the buccal and lingual contours obtained by the neutral zone record.

Anatomic acrylic resin denture teeth were used in this treatment. After teeth arrangement, maxillary and mandibular waxed dentures were evaluated for esthetics, stability and speech.

Posterior maxillary occlusal ramp

During the try in appointment, a softened 'ramp' of base-plate wax (Tru- Wax, Baseplate wax, Dentsply-caulk, Milford, DE) was placed palatal to the maxillary posterior teeth on the untreated side. Patient was guided through various mandibular movements and a functional occlusion generated in wax (Fig.7). Wax was softened slightly with a torch, and occlusal path refined. This record captured the mandibular excursion that the patient can use to enter and exit form centric position.

The maxillary and mandibular dentures were processed with conventional technique (Fig. 8).

Figs. 9 and 10 show the patient at the insertion appointment. Apart from routine post insertion instructions, the patient was advised to chew on non resected side to avoid denture instability. Post insertion denture evaluations and adjustments were performed at 24 hrs, 1 week and 1 month. Patient was satisfied with the treatment outcome (Figs. 9-12), and was recalled after 3 months for review.

DISCUSSION

The altered anatomy and neuromuscular control makes rehabilitation of an edentulous hemimandibulectomy patient, a clinical challenge. Denture stability is extremely difficult to achieve. In this case report a neutral zone record was used to physiologically contour the polished surface of the



Fig. 1: Intraoral view showing residual mandibular fragment and defect site.

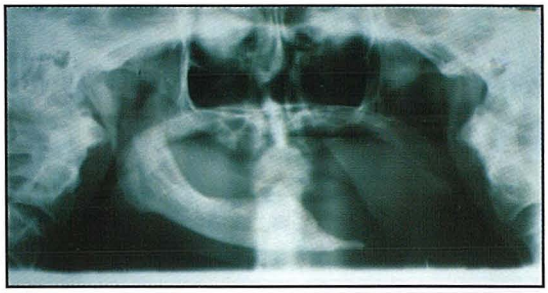


Fig. 2: Panoramic radiograph showing extent of mandibular resection.

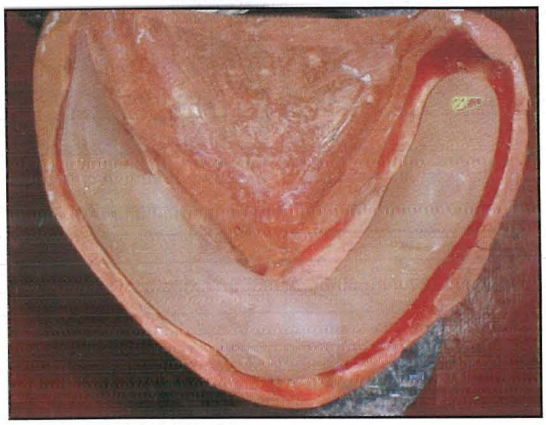


Fig. 3: Mandibular acrylic record base with three acrylic resin columns.

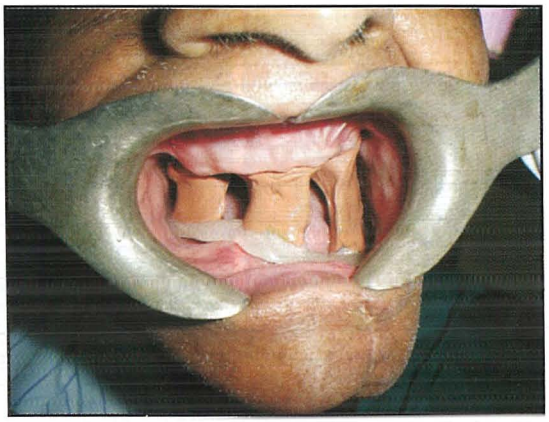


Fig. 4: Acrylic record base with resin columns and modeling compound stops

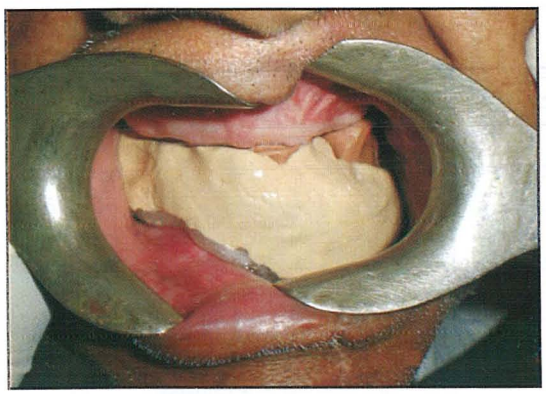


Fig. 5: Neutral zone record with soft putty.

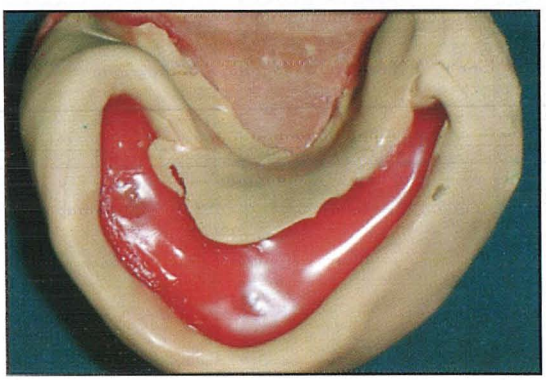


Fig. 6: Molten wax poured into silicone putty index to form a wax rim.

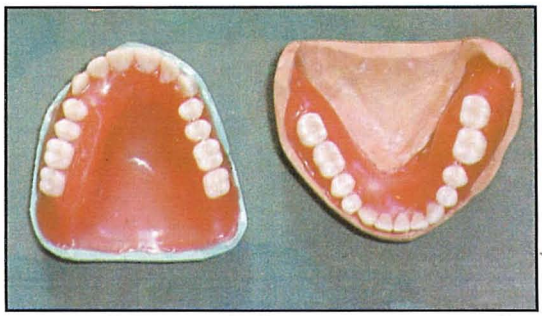


Fig. 7: Maxillary posterior occlusal ramp and mandibular teeth set in the neutral zone.

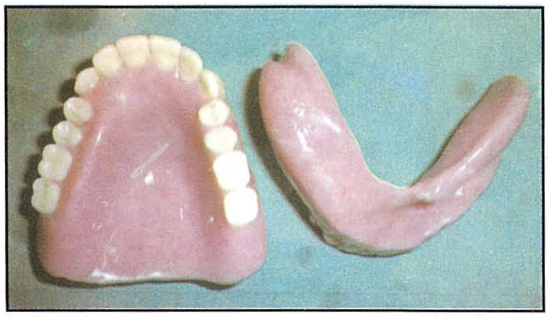


Fig. 8: Finished upper and lower dentures.



Fig. 9: Patient at denture insertion.

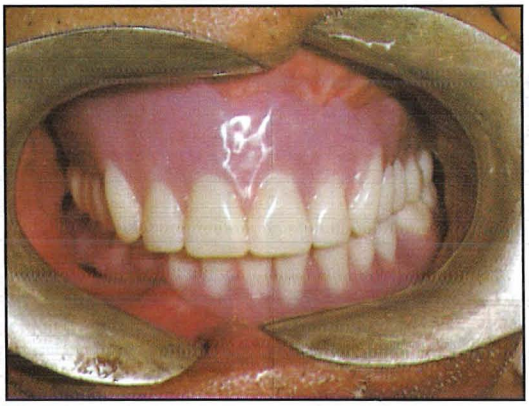


Fig. 10: Intraoral view of the patient at denture insertion

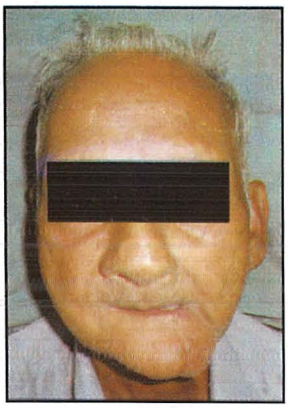


Fig. 11: Frontal view of patient without the dentures. Note the mandibular deviation to left

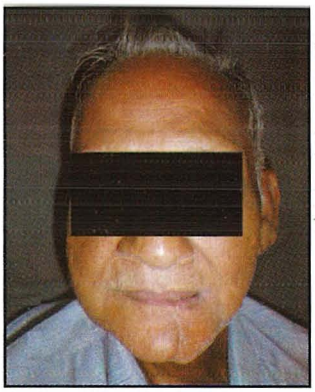


Fig. 12: Frontal view of patient with dentures and the improved mandibular position.

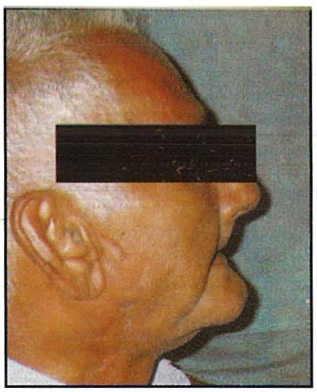


Fig. 13: Profile view of patient without dentures. Note the unsupported soft tissues.

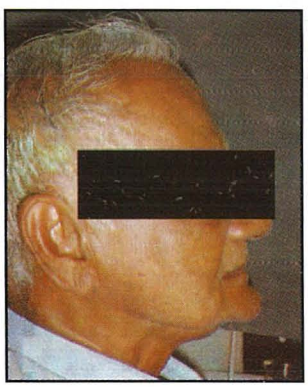


Fig. 14: Profile view of patient with dentures and improved lip and cheek support.

mandibular denture so that it does not encroach on the buccal and lingual musculature during function. This enhanced the denture stability and retention.

Various materials were advocated for recording the neutral zone like wax,[14] impression compound,[15] chairside reline material and polyvinyl siloxane materials[16]. Whatever the material used, two factors cannot be overlooked: First, the neutral zone must be recorded at the predetermined occlusal vertical dimension, second, the material used must be reasonably slow setting to permit the oral musculature to shape it to appropriate contour and dimensions.[9]

The posterior palatal ramp incorporated on the non defect side, slopes occlusally away from the maxillary teeth. It would guide the medially deviated residual mandibular fragment during closure and support it in the slightly displaced acquired position to enhance the stability to the denture. However an overextended occlusal ramp can interfere with speech, deglutition and respiration.[7]

Flat cusped or shallow angled cusped posterior prosthetic teeth are advocated to avoid eccentric contact.[2] Shallow angled cusped posterior teeth were used in this case to aid in retraining the deviated mandible.It may be necessary to accept on occlusion that is not bilaterally balanced in eccentric occluding positions for an edentulous resected maxilla or mandible.[17,18] No articulator can reproduce the movements of an interrupted mandible. Therefore occlusion can be developed with use of a static centric position record. This centric position often can be modified by use of functionally generated record to capture mandibular excursion that the patient can use to enter and exit from centric position.[2]

Esthetics can be enhanced and facial distortion masked by selective contouring of polished surfaces and creative placement of anterior teeth. Shifting the midline slightly towards defect side or tipping of the occlusal plane to correspond to asymmetrical facial droop can provide an optical illusion that makes disfigurement less conspicuous.

As changes in tissue beneath a maxillofacial prosthesis may be more rapid than those beneath an ordinary complete prosthesis, frequent evaluation of occlusion and denture base adaptation are mandatory.[2]

Above all, definitive clinical and psychological support to the patient and a realistic approach by the prosthodontist are key to success.

SUMMARY

Maxillary and mandibular complete dentures were constructed for a completely edentulous hemimandibulectomy patient. A posterior occlusal ramp was incorporated in the maxillary denture to guide and support the deviated residual mandibular fragment. Neutral zone record was used to determine the tooth position and final denture form for a stable mandibular denture.

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BOOK REVIEW



Title: Orthodontics: Diagnosis and Management of Malocclusion and Dentofacial Deformities

Author: Prof. (Dr.) O P Kharbanda, Prof. and Head, Division of Orthodontics and Dentofacial Orthopaedic, Centre for Dental Education and Research at theAll India Institute of Medica Sciences, New Delhi.

Pages: 562. First Ediction 2010

The book gives the basic yet in depth understanding of the science and clinical practice of orthodontics mainly for undergraduate students.

A total of 47 chapters in five sections cover a-z in orthodontics. The book includes in depth overview on diagnosis, treatment methods covering the entire spectrum from basic to complex situations and latest trends. The addition of evidence-based and current research along with colour photos of clinical case studies further substantiates the information presented. The book contents are well organized with information applicable to all fields of orthodontics for UG as well as PG students.

Tables and boxes throughout the text offer streamlined information supported with illustrated figures. The points given in boxes are reminders for the students and will help in the oral examination as well in writing answers in their summative exams.

Chapters Orthodontic Indices, Classification of malocclusion, Prevention and interception of malocclusion, Management of impacted and transposed teeth and Orthognathic surgery needs special mention and are very useful.

Reviewed by Prof. Pradeep Tandon, Head, Deptt. of Orthodontics & Dentofacial Orthopaedics, Faculty of Dental Sciences, CSM Medical University, Lucknow.

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