

Neutral Zone approach for severely atrophic ridges; Avenues beyond implants and surgeries – A Case Report

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Abstract

One of the most common problems encountered among long term denture wearers is the reduction in the denture foundation. Prosthodontic Rehabilitation of a patient with severely resorbed ridge is the most challenging therapy a prosthodontist can undertake. In order to have a favourable prognosis for the denture therapy, impression technique selected should be based on the present state of the basal tissue support. This article presents the application of neutral zone (NZ) concept being incorporated in to impression making procedure in an effort to achieve successful complete denture therapy.

KEYWORDS: Neutral zone, Dead zone, Atrophic mandible, Impression, Index.

Introduction

During childhood teeth erupt under the influence of muscular environment created by forces exerted by tongue cheeks and lips, in addition to the genetic factors. These forces has a definitive influence upon the position of the resultant arch form, and the occlusion. Generally muscular activity and habits which develop during childhood continue throughout life and after the loss of the teeth, it is important that the artificial teeth be placed in the arch form compatible with the muscular forces.

As the area of the impression surface decreases (due to alveolar ridge resorption), less influence it has on the denture retention and stability. Consequently, retention and stability becomes more dependent on correct positioning of the teeth and the contours of the external or polished surface of the dentures. Therefore these surfaces should be so contoured that horizontally directed forces applied by the peri-denture muscles should act to seat the denture in this well balanced muscular space. This potential space is known as neutral zone or, which is bounded by the tongue medially, and the lips and cheeks laterally.

The success of any prosthesis depends on the proper position of the artificial teeth within the neutral zone. Weinberg¹ stated that buccal cusps and fossae of the posterior teeth should be directly over the crest of the ridge. Heartwell and Rahn² indicated that the posterior teeth should be positioned buccolingually on the residual alveolar ridge. Pound³ stated that invariably arranging the teeth over the crest of the residual ridge condemned patients by accentuating facial deformity, provoking phonetic problems and making food manipulation difficult during deglutition. Robinson⁴, Payne⁵, Murray⁶, and Watt⁷ are of the opinion that artificial teeth should be positioned where the natural teeth grew. Beresin and Schiesser⁸ have suggested that the denture teeth should be arranged in the neutral zone, where during function the forces of the tongue pressing outward are neutralized by the forces of cheek and lips

pressing inward. Failure to recognize the importance of tooth position, flange form and contour often results in dentures which are unstable and unsatisfactory.

Dental implants placed with neutral zone technique stabilize the denture fabricated over atrophic mandibular ridge. However, there may be certain medical, surgical or economical conditions when it is not possible to provide implants. In such complex cases the neutral zone impression technique is the only option left for the stabilization of the complete denture. It is not only a treatment of choice in atrophic mandible but also in patients with partial glossectomy, mandibular resections or motor nerve damage to the tongue which have led to either atypical movement or an unfavourable denture bearing area. This present article describes the fabrication of a complete denture using neutral zone impression technique for enhanced stability and masticatory efficiency.

Case Report

A 71 year old male patient reported with the complaint of missing teeth and wanted its artificial replacement. On examination, it was found that both the upper and the lower arches were edentulous and severely resorbed (fig.1).



Figure.1 Edentulous Maxilla & Mandible

The wash impressions were made in a custom tray with zinc oxide eugenol impression material (Dental Products of India Ltd, India). During recording of the secondary impression the patient was asked to open, swallow and speak so as to bring all the muscles into function. The obtained impressions were poured with dental stone.

The record bases were fabricated, assessed and modified for stability, extension and comfort. Before making the neutral zone impression, the patient was made comfortable in an upright position with the head supported. The impression material (Green Impression Compound; Kerr Corp) was softened in a 65° C water bath. The softened compound was kneaded and a roll was formed according to the crest and was attached to the base. The attached roll of compound was reheated in

the water bath and was carried into the patient's mouth. With the record base firmly seated, the patient was asked to perform a series of actions like swallowing, speaking, sucking, pursing lips, pronouncing vowels sipping water and slightly protruding the tongue several times which simulated physiological functioning.

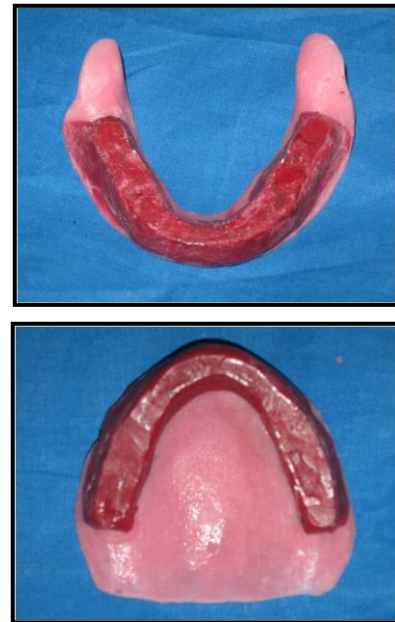


Figure. 2 Establishing neutral zone using impression compound

During function of the lips, cheeks, and the tongue, the forces exerted on the soft compound molds it into the shape of the neutral zone. After a few minutes when the compound has cooled, the record base with the compound rim (fig.2) is removed and placed in cool water bath. Maxillary rim was oriented in the patient's mouth, the height of the lower compound rim was adjusted with a sharp knife and Jaw registration was carried out.

The neutral zone impression so obtained was placed on the master model, locating grooves were cut on the master cast and was covered with a silicone putty index around the impression on both the labial and lingual sides (fig.3).

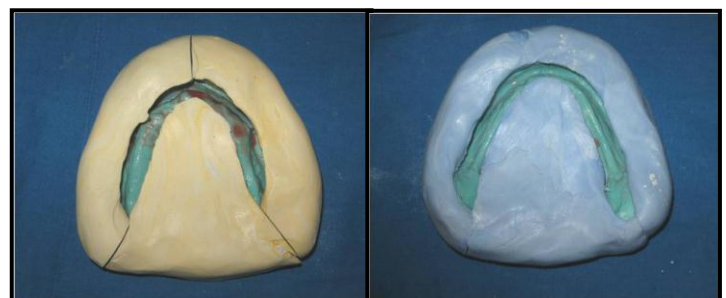


Figure. 3 Making tongue, lip and cheek matrices using silicone putty

The compound occlusal rim was then removed from the base plate and the index is replaced. The index would have preserved the space of the neutral zone. Teeth arrangement was done exactly following the index (fig.4). The position of the teeth was checked by placing the index together around the wax try-in. Once the waxed up trial dentures were ready, they were checked in the patients mouth for aesthetics, phonetics and occlusion.



Figure. 4 Selecting and arranging teeth in accordance to putty index

Later on, wax was removed from the labial and the lingual surfaces of the trial dentures leaving only minimal wax which could support the teeth that were placed. Patient was trained for making physiological movements such as tongue, cheek and lip movements. Once the patient was trained regarding the functional movements PVS light body (Aquasil Ultra LV Fast Set; Dentsply Caulk) was placed on the labial as well as lingual surfaces of the trial dentures (fig.5), it was placed in the mouth and patient was asked to perform movements. This procedure was carried out for both the maxillary and mandibular arches.



Figure. 5 Obtaining impression of the polished surface and establishing their contours in wax-up



Figure. 6 Processing the dentures



Figure. 7 Postoperative view of patient

This recorded the polished surfaces of the denture according to the neutral zone (fig.5). Once the try-in was deemed satisfactory the dentures were processed and finished (fig.6). Care was taken during finishing and polishing of the dentures so that the contours recorded previously were unaltered. During insertion the dentures are fully checked to eliminate any minor errors. The dentures provided the patient with improved facial appearance, stability and retention during function — as they have been constructed in harmony with their surroundings (fig.7).

Discussion

The ultimate goal of any prosthodontic treatment is to restore the form, function, and esthetics of the patient. Fish⁹ pointed that out of the three surfaces of the denture the polished surface is bounded by the tongue and the cheeks. These are involved in normal physiologic movements such as speech, mastication, swallowing, smiling, and laughing. Hence, the fabrication of the denture must be in harmony with these functions. Because physiologically unacceptable denture is responsible for poor prosthesis stability and retention¹⁰, insufficient facial tissue support¹¹, less tongue space¹² and compromised phonetics¹¹. Denture fabricated over

a severely resorbed mandibular ridge by neutral zone impression technique will insure that the muscular forces aid in the retention and stabilization of the denture rather than dislodging the denture during function^{13,14}. The dentures will also have other advantages such as reduced food lodgment, good esthetics due to facial support, proper positioning of the posterior teeth which allows sufficient tongue space¹⁵. Clinicians must identify and record the neuromuscular dynamics of the oral tissues and this should be applied in the construction of the definitive prosthesis that will exist within the stabilizing boundary conditions of the neutral zone area.

Conclusion

With advancement in dental material science and development of newer techniques in prosthodontics, the neutral zone impression technique may be incorporated into fabrication of any complete denture. Though this is indicated for patients with severe residual ridge resorption, the procedures discussed can also be used for full mouth rehabilitation of edentulous patients with dental implants.

References

1. Weinberg L. Tooth position in relation to the denture base foundation. *The Journal of Prosthetic Dentistry*. 1958;8(3):398-405.
2. Heartwell C, Rahn A. *Syllabus of complete dentures*: Lea & Febiger; 1974.
3. Pound E. Lost fine arts in the fallacy of the ridges. *The Journal of Prosthetic Dentistry*. 1954;4(1):6-16.

4. Robinson S. Physiological placement of artificial anterior teeth. *Journal of the Canadian Dental Association*. 1969;35(5):260.
5. Payne A. Factors influencing the position of artificial upper anterior teeth. *The Journal of Prosthetic Dentistry*. 1971;26(1):26-32.
6. Murray C. Re-establishing natural tooth position in the edentulous environment. *Australian Dental Journal*. 1978;23(5):415.
7. Watt DM. Tooth positions on complete dentures. *J Dent*. 1978;6(2):147-60.
8. Beresin VE, Schiesser FJ. The neutral zone in complete dentures. *J Prosthet Dent*. 1976;36(4):356-67.
9. EW. F. An analysis of the stabilizing force in full denture construction. *Br Dent J*. 1947;83:137-42.
10. Wright CR. Evaluation of the factors necessary to develop stability in mandibular dentures. *J Prosthet Dent*. 1966;16(3):414-30.
11. Fahmy FM, Kharat DU. A study of the importance of the neutral zone in complete dentures. *J Prosthet Dent*. 1990;64(4):459-62.
12. Wright C, Swartz W, Godwin W. *Mandibular denture stability: a new concept*: Overbeck; 1961.
13. Fahmi F. The position of the neutral zone in relation to the alveolar ridge. *The Journal of Prosthetic Dentistry*. 1992;67(6):805-9.
14. Lammie GA. Aging changes in the complete lower denture. *J Prosthet Dent* 1956;6:450-64.
15. Lott F, Levin B. Flange technique, an anatomic and physiologic approach to increased retention, function, comfort, and appearance of denture. *J Prosthet Dent* 1996;16:394-413.

