

CASE REPORT

Utilization of Neutral Zone Technique for Rehabilitation of Atrophic Maxillary and Mandibular Ridges: A Clinical Report

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ABSTRACT

The neutral zone technique is an alternative approach for the construction of the complete dentures. It is most effective for dentures where there is a highly atrophic ridge. The technique aims to construct a denture that is shaped by muscle function and is in harmony with the surrounding oral structures. This clinical report describes the fabrication of complete dentures for a patient with poorly formed both maxillary and mandibular ridges.

Keywords: Neutral zone, Complete denture, Impression compound.

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INTRODUCTION

To increase the stability and retention of mandibular dentures, previous reports^{1,2} have recommended that posterior denture teeth be positioned directly over the crest of the edentulous ridge. This relationship of the teeth and alveolar ridge is important for the stability of the denture in function.^{1,2} Although this tooth position may be desirable when adequate alveolar ridge height is available, such a position may not be suitable for severely resorbed ridges because of a lateral shift in the orientation of the ridge crest. This horizontal discrepancy between original tooth position and resorbed ridge crest, coupled with an increased vertical distance between occlusal table and tissue support, can lead to denture instability. Successful denture treatment in situations like this can become increasingly dependent on the position of the denture teeth and the external contours of the dentures. It is for these patients that the neutral zone concept³⁻⁷ becomes increasingly significant. The lower denture commonly presents the most difficulties with pain and looseness being the most common complaint.⁸ This is because the mandible atrophies at a greater rate than the maxilla and has less residual ridge for retention and support.⁹ The neutral zone technique is most effective for patients who have had numerous unstable, unretentive lower complete dentures. These patients usually have a highly atrophic mandible and there has been difficulty in positioning the teeth to produce a stable denture.¹⁰

Sir Wilfred Fish in 1931, first described the influence of the polished surfaces on retention and stability.¹¹ He also described how dentures should be constructed in the 'dead space', which later became known as the neutral zone.³

The neutral zone has been defined as the potential space between the lips and cheeks on one side and the tongue on the other; that area or position where the forces between the tongue and cheeks or lips are equal.¹²

Two clinical studies have described the advantages of using the neutral zone technique. Cinefluorographic studies by Sheppard¹³ have shown that the muscles reseal the complete denture during function. In another clinical study, Fahmy and Kharat⁴ evaluated patients' chewing efficiency and satisfaction for complete dentures made with either a conventional or neutral zone technique. Patients had a better chewing efficiency when wearing conventional dentures; however, patients could not detect any difference in masticatory performance between their conventionally fabricated dentures and neutral zone dentures. Patients did report greater comfort and improved speech clarity with the dentures fabricated using the neutral zone technique compared with their conventional prepared dentures. These studies suggest that the neutral zone strategy for denture fabrication may be helpful in certain edentulous situations.

The purpose of this article is to present the use of the neutral zone technique for the fabrication of successful and stable maxillary and mandibular complete denture with severely resorbed ridges.

CASE REPORT

An 80-year-old male patient reported to the Department of Prosthodontics, Darshan Dental College, Udaipur with a chief complaint of old unstable maxillary and mandibular complete denture. The patient was advised for the fabrication of complete denture with neutral zone technique as other treatment options like implant supported complete denture was not feasible due to the age and cost factors (Fig. 1).

Procedure

A detailed examination was completed and his previous dentures were evaluated for retention and stability. The old denture was found to be unstable and was not retentive.



Fig. 1: Preoperative photograph

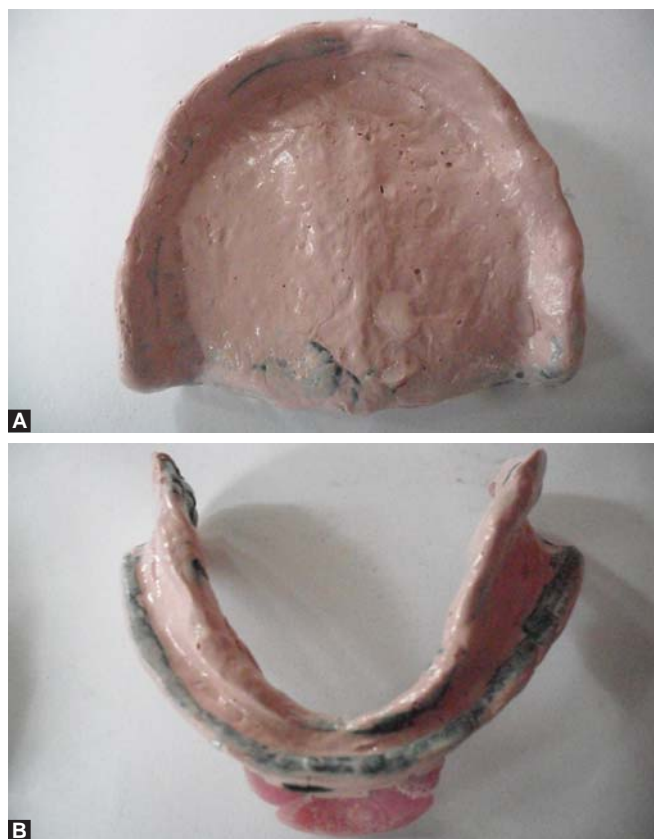
Also, the old denture can not be relined. The lower ridge was highly resorbed whereas maxillary ridge was slightly resorbed posteriorly on the both sides (Figs 2A and B).

1. The primary impression was made using elastomeric impression material (alginate) with a perforated edentulous stock tray.
2. Closely fitting custom tray was fabricated and the border molding was performed with low fusing type I impression compound (green stick) to represent muscle activity, recording functional depth and width of the sulcus.



Figs 2A and B: Resorbed maxillary and mandibular ridges

3. The final wash impressions were made with a low viscosity mucostatic zinc oxide eugenol paste (Figs 3A and B).
4. Impressions were evaluated for accuracy and master cast was poured with dental stone. Both the casts were then duplicated.
5. The wax record rims were then constructed and assessed for extension, comfort and stability.
6. Jaw relation was carried out conventionally to record vertical and centric relation and the cast was articulated on mean value articulator.
7. Then the other set of record rims were fabricated on the new denture bases on duplicate master cast. These rims were made up of type I impression compound (Fig. 4).
8. First the mandibular rim was adjusted at the same vertical height with maxillary rim maintaining the vertical stop.
9. Before recording the neutral zone the patient was made to sit in a comfortable, upright position with the head unsupported.
10. The mandibular compound rim was then inserted into patient's mouth and he was asked to perform a series of actions designed to simulate the physiological functioning, such as asking the patient to smile, grin, pout/purse lips, count from 60 to 70, talk aloud,



Figs 3A and B: Maxillary and mandibular wash impressions

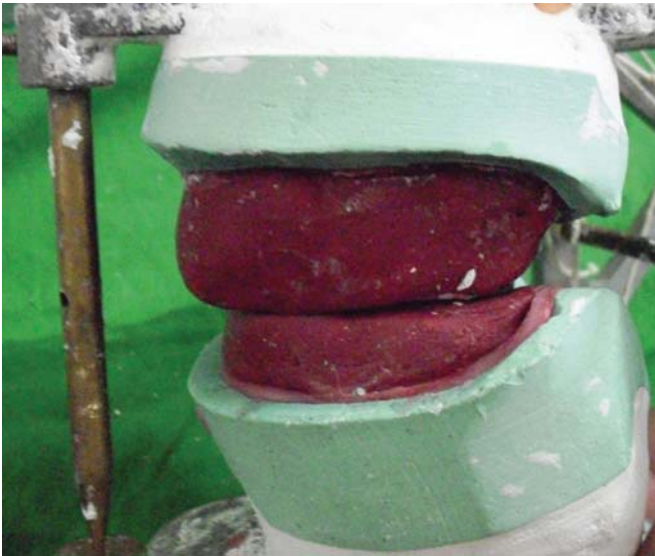


Fig. 4: Record rims made up of impression compound placed on mean value articulator

pronounce the vowels, sip water, swallow, slightly protrude the tongue and lick the lips. These actions are repeated for 10 minutes until the compound became hard.

11. Now the maxillary rim was adjusted at the same vertical height with mandibular rim maintaining the vertical stop. Same actions were repeated again for 10 minutes.
12. Both the compound rims were then replaced on the articulator to evaluate the vertical relation again (Figs 5A and B).

Laboratory Stages

1. The compound rims were placed on the duplicate master cast and the locating grooves were cut. The plaster indices were made around the molded impression compound rims (Figs 6A and B).
2. Then the molded impression compound rims were removed from the base plate and the index was replaced. The indices preserve the space of the neutral zone.
3. Wax was then poured into the space giving an exact representation of the neutral zone.
4. This newly formed wax rims were then replaced on the articulator.
5. Teeth arrangement was done exactly following the indices. During the setting up of the teeth their position was checked by putting the indices together around the wax try-in (Figs 7A and B).
6. Trimming of the artificial posterior teeth has to be done to accommodate it on the narrow space of neutral zone.
7. Wax try-in was done.
8. Dentures were processed and finished in a routine manner. Polishing was done lightly so as to preserve the contour of the flanges.

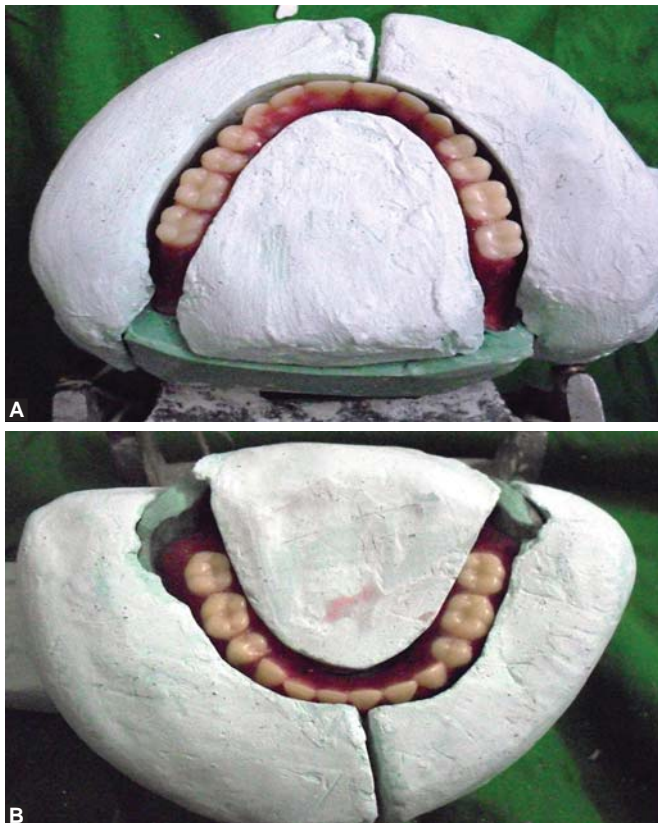


Figs 5A and B: Record rims after functional molding

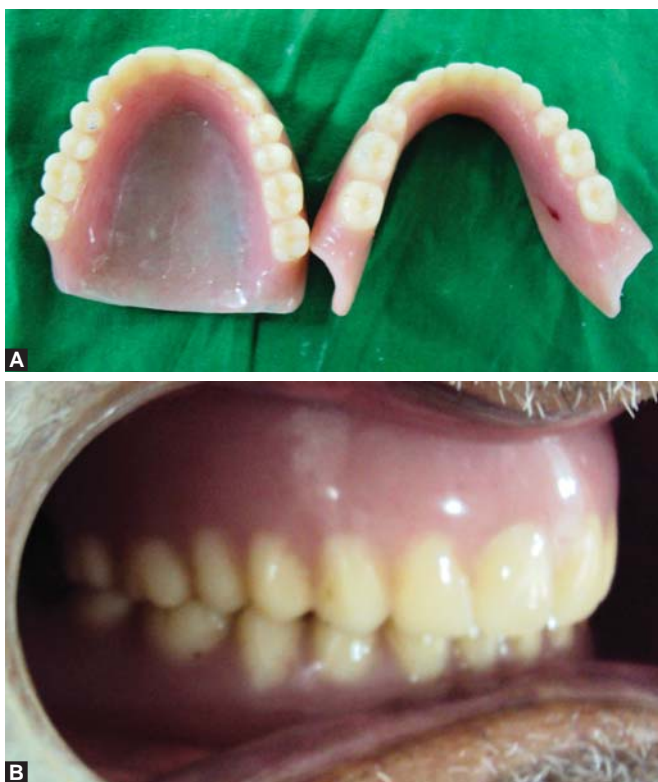


Figs 6A and B: Plaster indices around molded impression compound

9. Dentures were finally inspected and clinical remounting was done to eliminate minor occlusal errors (Figs 8A and B).



Figs 7A and B: Teeth arrangement according to plaster indices



Figs 8A and B: Finished complete dentures extraoral and intraoral photographs

DISCUSSION

The ultimate aim of prosthodontics is to restore form, function and esthetics. Pound¹⁴ pointed out that in advanced resorption the maxillary ridge moves lingually and mandibular ridge moves buccally. Atwood⁹ divides the factors related to the rate of resorption into the categories of anatomic, metabolic, functional and prosthetic. Our knowledge of these factors is imperfect, we know that resorption may take place despite our best efforts at prevention. The neutral zone approach registers the neutral zone to determine the proper placement of teeth after resorption has taken place. It is opinion of many that the maxillary anterior teeth should be placed close to the position of the natural anterior teeth. If this is not accomplished, esthetics and phonetics might be compromised. In addition, the position, of the maxillary teeth must satisfy the desires of the patient. Neutral zone registrations may dictate that the mandibular anterior teeth be placed lingually by the lower lip. This usually can be accomplished without sacrificing esthetics. When the patient functionally molds the maxillary and mandibular rim into the area of the neutral zone, the result is a more stable record base.

CONCLUSION

The use of the neutral zone concept for denture fabrication has been advocated since the 1930s. The neutral zone is an alternative technique for the construction of complete dentures on highly atrophic ridges. It is especially useful in cases where dental implants are not possible and the copy technique would be inappropriate. The aim of the neutral zone is to construct a denture in muscle balance, as muscular control will be the main stabilizing and retentive factor during function. The technique is relatively simple but there are increased chair time and laboratory costs.

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