

The Neutral Zone Approach: A Better Outcome for Resorbed Mandibular Ridges - A Case Report

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ABSTRACT

The neutral zone technique is an alternative method for creating complete dentures, particularly beneficial for patients with significantly atrophied (shrunk) jawbones. This approach focuses on constructing dentures that are shaped and stabilized by the natural forces of the surrounding oral muscles and tissues. This clinical report details the process of creating complete dentures for a patient with poorly developed mandibular ridges using this technique.

Keywords: Denture stability, Neutral zone, Resorbed ridge.

INTRODUCTION

Complete denture fabrication aims to restore oral function, aesthetics, and comfort to edentulous patients. However, achieving these goals can be challenging, especially in cases of significant bone resorption, where traditional denture techniques may prove inadequate. The concept of the neutral zone, first described by Fish in 1931, provides a valuable framework for overcoming these challenges by considering the dynamic interplay of oral musculature.

The neutral zone is 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." Essentially, it represents the area where the outward forces generated by the tongue are neutralized by the inward forces exerted by the lips and cheeks.

Studies have suggested that placing posterior denture teeth directly above the crest of the edentulous mandibular ridge can enhance the stability and retention of lower dentures. This alignment between teeth and ridge is crucial for ensuring the denture's functionality. This relationship of the teeth and alveolar ridge is important for the stability of the denture in function. 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. The horizontal mismatch between the original tooth positions and original tooth position and resorbed ridge crest, combined with the increased vertical distance between the denture's biting surface and the underlying tissues, can result in unstable dentures.

In cases of significant bone resorption, the success of denture treatment hinges heavily on the precise positioning of denture teeth and the careful design of the denture's external contours. For these patients, the concept of the neutral zone gains paramount importance. Lower dentures, in particular, often pose the greatest challenges, with pain and looseness being frequent patient complaints. Mandibular bone resorption typically occurs at a faster rate than maxillary resorption, resulting in less residual bone for denture support and retention. Consequently, lower dentures often present greater challenges in terms of stability and retention.

The neutral zone technique proves particularly beneficial for patients who have experienced difficulties with multiple unstable and poorly retentive lower dentures. These patients usually exhibit significant mandibular atrophy and have encountered challenges in achieving denture stability through conventional tooth positioning.

Cinefluorographic studies conducted by Sheppard demonstrated that muscular forces actively reposition complete dentures during functional activities. In a separate clinical study, Fahmy and Kharat assessed patient chewing efficiency and satisfaction for complete dentures fabricated using either conventional or neutral zone techniques.

While patients exhibited slightly better chewing efficiency with conventional dentures, they were unable to discern any significant difference in masticatory performance

between dentures fabricated using conventional techniques and those constructed based on the neutral zone principle. However, patients reported significantly greater comfort and improved speech clarity with neutral zone dentures compared to their conventionally fabricated counterparts. These findings suggest that the neutral zone approach may offer valuable benefits in specific edentulous scenarios.

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.

A CASE REPORT

A 84-year-old male patient reported to the Department of Prosthodontics at Rama Dental College & Hospital, Kanpur, 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 dentures was not feasible due to the age and cost factors.

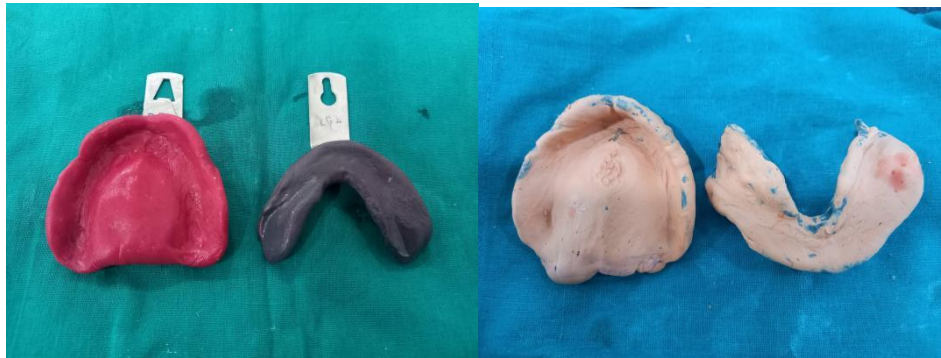


Procedure :

A thorough examination was conducted, and the patient's existing dentures were assessed for retention and stability. The evaluation revealed that the dentures were unstable and lacked adequate retention. Furthermore, it was determined that relining the existing dentures was not a viable option.

The lower ridge was highly resorbed whereas maxillary ridge was slightly resorbed posteriorly on the both sides.

- The primary impression was made using impression compound for maxillary arch, whereas for mandibular arch admixed technique was followed i.e. impression compound was mixed with green stick in 3:7 ratio.
- Closely fitting custom tray was fabricated and the border molding was performed with low fusing impression compound (green stick) to represent muscle activity, recording functional depth and width of the sulcus.
- The final wash impressions were made with zinc oxide eugenol.



Impressions were evaluated for accuracy and master cast was poured with dental stone. Both the casts were then duplicated.

- The wax record rims were then constructed and assessed for extension, comfort, and stability.
- Jaw relation was carried out conventionally to record vertical and centric relation and the cast was articulated on mean value articulator.
- 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.
- First the mandibular rim was adjusted at the same vertical height with maxillary rim maintaining the vertical stop.
- Before recording the neutral zone the patient was made to sit in a comfortable, upright position with the head unsupported.
- 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, pronounce the vowels, sip water, swallow, slightly protrude the tongue and lick the lips. These actions were repeated for 10 minutes until the compound became hard.
- Then 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.
- Both the compound rims were then replaced on the articulator to evaluate the vertical relation again.

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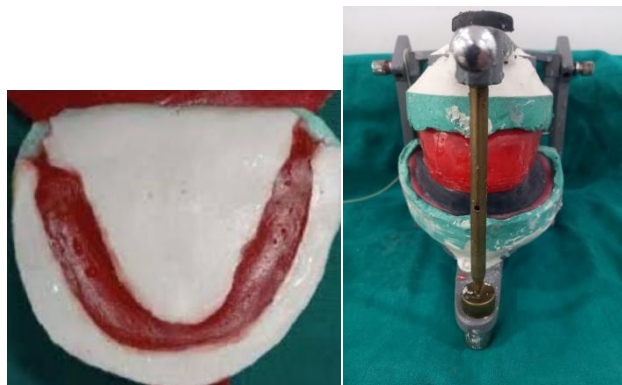


Laboratory stages :

The compound rims were placed on the duplicate master cast and the locating grooves were cut. The plaster index was made around the molded impression compound rim.

- Then the molded impression compound rims were removed from the base plate and the index was replaced. The index preserve the space of the neutral zone.

- Wax was then poured into the space giving an exact representation of the neutral zone.
- The newly formed wax rims were then replaced on the articulator.



- 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.
- Modification of the artificial posterior teeth had to be done to accommodate it on the narrow space of neutral zone.
- Wax try-in was done.
- Dentures were processed and finished in a routine manner. Polishing was done lightly so as to preserve the contour of the flanges.



- Dentures were finally inspected and clinical remounting was done to eliminate minor occlusal errors.
- Insertion of finished maxillary and mandibular dentures were done.



DISCUSSION

The primary objective of prosthodontics is to restore oral function, aesthetics, and form. Pound emphasized that in cases of significant bone loss, the maxillary ridge tends to shift lingually, while the mandibular ridge shifts buccally. Atwood categorized the factors influencing the rate of bone resorption into anatomic, metabolic, functional, and prosthetic categories. Although our understanding of these factors remains incomplete, it's acknowledged that bone resorption can occur despite

preventive measures. The neutral zone technique aims to determine the optimal tooth placement after bone resorption has occurred.

Many clinicians believe that maxillary anterior teeth should be positioned closely to their original locations to maintain aesthetics and proper speech function. Additionally, the position of these teeth must align with the patient's aesthetic preferences. While neutral zone registration may necessitate placing mandibular anterior teeth more lingually, this can usually be achieved without compromising aesthetics. By having the patient functionally mold the maxillary and mandibular rims within the neutral zone, the final denture base will exhibit enhanced stability.

CONCLUSION

The concept of the neutral zone has been utilized in denture fabrication since the 1930s. This approach offers an alternative solution for constructing complete dentures on severely resorbed ridges, particularly when dental implant placement is not feasible. The primary objective of the neutral zone technique is to create a denture that harmonizes with the dynamic forces of the oral musculature, recognizing that muscular control will be the primary determinant of stability and retention during function. While the technique itself is relatively straightforward, it's important to acknowledge the increased chair time and laboratory costs associated with its implementation.

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