



Clinical Significance of Neutral Zone in Managing Resorbed Mandibular Ridge: A Case Report

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ABSTRACT:

The neutral zone concept in complete dentures plays a crucial role in enhancing stability and compatibility, especially in patients with severe residual ridge resorption where implant treatment is not feasible. By utilizing the neutral zone technique, clinicians can improve retention, support, and stability in complete dentures. Incorporating the neutral zone approach in denture fabrication involves recording a stable record bases, ultimately optimizing denture stability. Additionally, the neutral zone impression technique is valuable for constructing lower complete dentures in highly atrophic ridges, shaping the denture based on muscle function and oral structures to improve stability. This comprehensive approach, including the use of the neutral zone concept, is essential in prosthetic rehabilitation for patients with severely atrophic ridges, requiring modifications in complete denture treatment.

Introduction

The lower denture commonly presents the most difficulties with pain and looseness being the most common complaint.¹ This is because the mandible atrophies at a greater rate than the maxilla and has less residual ridge for retention and support.² The neutral zone is a critical consideration in complete denture prosthodontics, where the stability and function of dentures are influenced by the equilibrium of muscular forces. The neutral zone in complete denture prosthodontics refers to the area where the displacing forces of the tongue pressing outward and the cheeks and lips pressing inward are balanced. Properly designed dentures within this zone enhance stability,

retention, and function. This zone is critical because it represents the area where the denture can achieve maximum stability and retention by being least affected by displacing forces during function³.

The proper positioning of the teeth and the denture base within the neutral zone ensures optimal comfort, function, and esthetics for the patient. Many theories have been proposed for enhancing the mandibular denture's stability. The majority of research suggests that posterior denture teeth should be positioned either directly over the crest of the edentulous ridge or in the same position as their natural tooth predecessors. Weinberg⁴ suggested that buccal cusps and central fossae of mandibular posterior denture teeth should be



arranged directly over the crest of the edentulous residual ridge.

Pound⁵ recommended that the lingual surfaces of mandibular posterior denture teeth should occupy an area bounded by two lines originating from the mesial surface of the mandibular canine and extending posteriorly to the lingual and buccal aspects of the retromolar pad. Lammie⁶ suggested that mandibular posterior denture teeth should be arranged over the buccal shelf to provide increased tongue space and to facilitate the development of vertical facial polished surfaces, against which an effective facial seal can be achieved and maintained. This case study approaches to construct a mandibular denture using the conventional neutral zone technique and to use improvised procedures to minimize the chairside visits for the patient.

Case Report

A 64-year-old female patient reported to the Department of Prosthodontics at Bhabha College of Dental Sciences, Bhopal with the chief complaint of missing teeth and wanted its artificial replacement. On examination, it was found that the both arches were edentulous and severely resorbed mandibular ridge (Figure 1). 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.



Figure 1: Severely Resorbed Ridge

Primary impressions of the upper jaw were made with impression compound and lower jaw was made with admixed technique (3 parts of green stick compound and 7 parts of impression compound) 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. Maxillary secondary impression was made and a wax rim and a lower special tray were constructed. The special tray was a plate of acrylic adapted to the lower ridge, without a handle, with spurs or fins projecting upward toward the upper arch.



Figure 2: Neutral Zone Recorded

These help with the retention of the low fusing compound. The lower special tray with the softened low fusing compound in a 65° C water bath was placed in the patient's mouth; this tray was very carefully adjusted in the mouth to be sure that it was not overextended and remained stable during opening, swallowing, and speaking.

The patient was then asked to talk, swallow, drink some water, etc. After 5-10 min, the set impression was removed from the mouth and examined. The neutral zone impression so obtained was placed on master cast (Figure 2). The neutral zone impression so obtained was placed on master cast (Figure 4), master cast was covered with separating medium on buccal and lingual side & plaster index around the impression on both the labial and lingual sides were made. The index contained three notches: one in the anterior regions and two in the posterior regions for easy index removal (Figure3).



Figure 3 Plaster index around the impression with 3 notches

The compound occlusal rim was then removed from the base plate and melted modelling wax was poured into that index space (Figure 4).



Figure 4: Impression compound removed & melted modelling wax poured in space

Final vertical jaw relation recorded. The maxillary and the mandibular rims were fused at the centric relation. The occlusal rims were articulated in a mean value articulator. Teeth were arranged exactly following the POP index. The position of the teeth was checked by placing the index together around the wax try-in. Once the waxed up dentures were ready, they were checked in the patient's mouth for esthetics, phonetics and occlusion. After try in was carried out satisfactorily, the dentures were fabricated, finished and inserted in patient's mouth. Wax rims were adjusted in the patient's mouth to conform to the recorded neutral zone. Phonetic tests were performed to ensure proper positioning of teeth within the neutral zone. The occlusal plane was adjusted for optimal function and aesthetics. The wax try-in was conducted, and minor adjustments were made based on patient feedback and clinical evaluation. The final dentures were processed,

finished, and polished. The new dentures were delivered, and the patient was instructed on proper care and maintenance. Immediate improvements in denture retention and stability were noted. Follow-up visits at one week, one month, and three months were scheduled to monitor the patient's adaptation to the new dentures. The patient reported significant improvements in comfort, stability, and ability to chew and speak effectively. No sore spots or mucosal irritation were observed.

Discussion

The absence of natural teeth in edentulous people changes mouth muscle dynamics. The neutral zone approach addresses these variations by deliberately putting the denture within a balanced area, ensuring that the prosthesis stays stable and functional. The incorporation of the neutral zone in complete denture fabrication resulted in significant improvements in the patient's prosthetic experience. Simple impression processes were used to provide the ideal retention and stability of the entire denture, especially on the mandibular ridges. The functional impression technique effectively captured the neutral zone, leading to better stability and retention of the dentures.^{7,8} A denture made using the neutral zone technique ensures that the muscles work together more effectively and increases the ability of the perioral and oral musculatures to stabilize.⁹ Recent studies have highlighted the importance of precision and accuracy in the fabrication of dental prostheses, including complete dentures. The neutral zone concept is pivotal in complete denture prosthodontics, emphasizing the region in the oral cavity where the forces exerted by the tongue, cheeks, and lips reach equilibrium.¹⁰ This area is crucial for the stability and retention of dentures, as it minimizes the displacing forces during functional activities like speaking and chewing.¹¹ Wright et al¹² believed that posterior mandibular denture teeth should be arranged directly over the center of the denture stress-bearing area. This location may not correlate with the crest of the edentulous ridge, particularly in the presence of severe ridge atrophy. Campbell¹³ stated that mandibular posterior denture teeth should be arranged slightly lingual to the crest of the edentulous ridge, while the maxillary posterior denture teeth should be arranged slightly buccal to the edentulous ridge. By prioritizing the natural balance of forces, the technique ensures that



the dentures not only fit well but also function efficiently, accommodating the dynamic nature of the oral cavity.¹⁴ This approach is especially beneficial for patients with severely resorbed alveolar ridges, where conventional dentures might struggle to achieve adequate retention.

Conclusion

This case report demonstrates the successful application of the neutral zone concept in complete denture prosthodontics. By focusing on the balance of muscular forces, the fabricated dentures provided enhanced stability, comfort, and function, leading to high patient satisfaction. Further studies and clinical reports are encouraged to validate and refine techniques for recording and utilizing the neutral zone in denture fabrication. One of the significant advantages of the neutral zone technique is its adaptability to various clinical scenarios.

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