CASE REPORT

WHERE MUSCLES MEET MECHANICS: NEUTRAL ZONE APPLICATION IN COMPLETE DENTURES—A CASE REPORT

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Abstract

Residual ridge resorption (RRR) is a continuous, irreversible, and cumulative process that presents considerable difficulties in the fabrication and functional success of complete dentures. This condition results in the reduction of sulcus depth, loss of vertical dimension, and a decrease in lower facial height, which collectively compromise denture stability and patient comfort. Mandibular ridge resorption further leads to problems such as diminished retention, reduced stability, and altered neuromuscular control.

The neutral zone concept plays a crucial role in addressing these challenges. It refers to the region within the oral cavity where the outward forces exerted by the tongue are balanced by the inward forces of the lips and cheeks during functional activities. The neutral zone technique serves as an alternative method for the fabrication of mandibular complete dentures, particularly in patients with severely resorbed ridges and a history of denture instability. This approach focuses on developing a denture contour that is molded by muscle function and harmonized with the surrounding oral musculature.

Enhanced retention and stability, along with reduced chairside adjustments, are key advantages of this technique, making it especially valuable in managing clinically demanding complete denture cases. This case report describes a novel approach for neutral zone

Key words : Neutral zone, Denture stability, Resorbed ridges

Introduction

The primary aim of complete denture therapy is to provide prostheses that ensure comfort, functional efficiency, and satisfactory aesthetics. The successful fulfillment of these goals largely depends on adequate denture retention and stability. Although complete dentures are mechanical devices, their optimal performance in the oral environment requires harmonious integration with the patient's neuromuscular system.

Essential oral functions such as speech, mastication, swallowing, and facial expressions depend on the coordinated activity of the tongue, lips, cheeks, and floor of the mouth. These interactions are complex and vary among individuals. Inadequate consideration of tooth position, flange design, and denture contour can lead to instability and patient dissatisfaction, even

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when the prosthesis is meticulously planned and fabricated.[1]

The neutral zone concept, first introduced in 1931 by Wilfred Fish of England, plays a pivotal role in addressing these challenges. It is defined as the potential space within the oral cavity located between the lips and cheeks on one side and the tongue on the other. This zone represents the area where the opposing muscular forces are in equilibrium. Simply stated, the neutral zone is the region where intraoral muscular forces are balanced and neutralized.[2]

Over the years, this concept has been described using various terminologies by different authors. Russell termed it the "Reciprocal Space," Robert referred to it as the "Potential Space," Heath described it as the "Denture Space," Bates named it the "Reciprocal Zone," Mathew called it the "Zone of Minimum Conflict," and Fenn referred to it as the "Zone of Neutral Muscular Forces."

The application of the neutral zone technique offers several advantages. It enhances denture stability during functional movements, improves overall retention, allows accurate positioning of posterior teeth while maintaining adequate tongue space, promotes efficient mastication, and increases overall patient comfort.

Numerous materials have been proposed for recording and shaping the neutral zone, including modeling plastic impression compound, soft wax, impression plaster, polymers of dimethyl siloxane filled with calcium silicate, silicone-based materials, tissue conditioners, and resilient lining materials.[3]

This case report presents a novel method for the registration of the neutral zone, aimed at improving the functional stability and retention of mandibular complete dentures.

Case Report:

A 60-year-old male patient presented to the Department of Prosthodontics with the primary complaint of an unstable and poorly fitting mandibular complete denture. His medical history was non-contributory, and there was no evidence of neuromuscular incoordination. The patient reported experiencing difficulty in jaw movements while wearing the complete denture over the past two years, which resulted in impaired mastication and speech, mainly due to the looseness of the lower denture.

Clinical examination revealed a well-formed, rounded maxillary residual alveolar ridge. In contrast, the mandibular residual ridge was compromised, exhibiting advanced resorption and was classified as Atwood's Order V (low and well-rounded). (Fig.1)

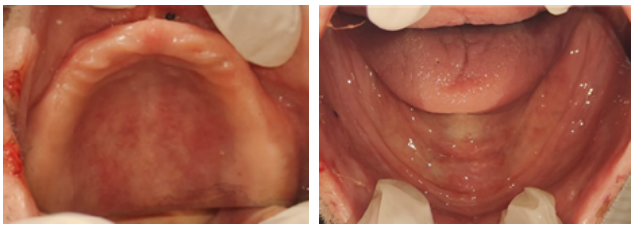

Figure 1 : Intraoral Photographs

The treatment plan for this patient involved fabricating a mandibular denture using the neutral zone technique to enhance prosthesis stability, comfort, and functional efficiency. This included identifying the neutral zone, positioning the denture teeth accordingly, and reducing the continuous resorption of the residual alveolar ridges.

At the initial appointment, primary impressions of the edentulous maxillary and mandibular residual ridges were recorded using impression compound. (Fig.2)

Figure 2 Primary Impression

The impressions were promptly poured in dental plaster to obtain the primary casts. Custom impression trays were then fabricated using cold-cure acrylic resin. Subsequently, border molding was carried out using an admix material consisting of three parts by weight of impression compound and seven parts by weight of tracing compound, following which the secondary impression was made. (Fig.3)

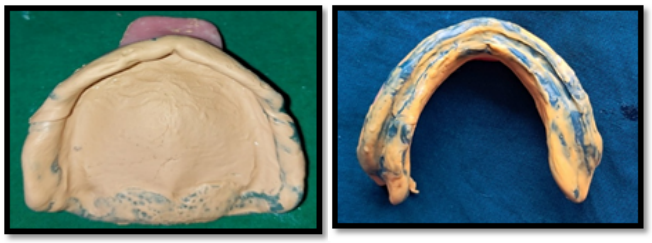

Figure 3 Border Moulding & Secondary Impression

The master cast was poured using dental stone, following which cast was duplicated. Wax record rims were then fabricated and evaluated for appropriate extension, comfort, and stability. Conventional jaw relation procedures were carried out to record the vertical dimension and centric relation, and the casts were subsequently mounted on a mean value articulator. An additional set of record rim was fabricated on the new denture base using the duplicated master cast. This denture base was incorporated with stainless steel wire loops to provide support for the occlusal rim. (Fig.4)

Figure 4 Stainless steel loop for support

This rim was constructed from a mixture of Type I impression compound and greenstick compound. Initially, the mandibular rim was adjusted to the same vertical height as the maxillary rim while maintaining the established vertical stop.

Prior to neutral zone recording, the patient was seated comfortably in an upright position with the head unsupported. The mandibular compound rim was then placed intraorally, and the patient was instructed to perform various functional movements, including smiling, lip pursing, counting aloud, speaking, vowel pronunciation, sipping water, swallowing, tongue protrusion, and lip licking. (Fig.5)

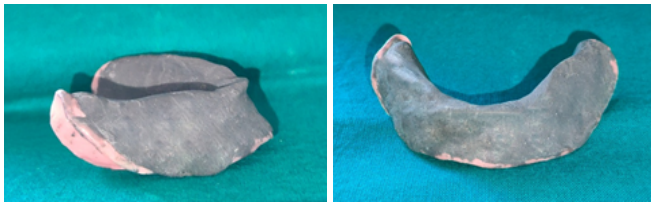

Figure 5

Laboratory Stages:

1. The compound rims were positioned on the duplicated master cast, and locating grooves were created. A putty index was then fabricated around the molded impression compound rim.
2. The molded impression compound rims were then removed from the base plate, and the index was repositioned, thereby preserving the space of the neutral zone. Wax was then poured into the space giving an exact representation of the neutral zone. (Fig.6)

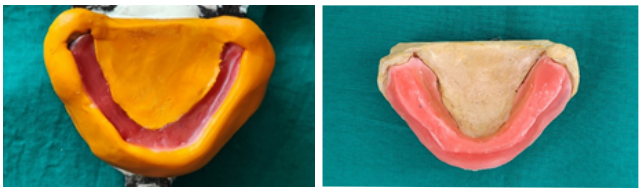

Figure 6 Wax rim with representation of neutral zone

3. The newly formed wax rims were then replaced on the articulator.
4. Teeth arrangement was done exactly following the putty index. During the setting up of the teeth their position was checked by putting the putty index around the wax try-in. (Fig.7)

Figure 7 Try in check with putty index

5. 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.
6. Insertion of finished maxillary and mandibular dentures were done. (Fig. 8)

Figure 8 Insertion done

Discussion

In oral rehabilitation, especially within geriatric prosthodontics, several factors influence the success and functionality of complete dentures. Clinically, it is commonly observed that mandibular dentures tend to be less stable than maxillary dentures. This instability is often associated with increased life expectancy, age-related decline in neuromuscular adaptability, and continuous resorption of the mandibular ridge. To address the persistent problem of denture instability, the neutral zone concept has been introduced as a therapeutic approach in prosthodontic practice.[4]

Positioning the denture within this zone helps prevent displacement resulting from an imbalance between lingual and vestibular muscular forces. As a result, placing the teeth directly over the crest of the residual alveolar ridge may not always be feasible for achieving optimal denture stability. Instead, proper tooth positioning is governed by the balance of opposing muscular pressures. Hence, tooth arrangement should not be based solely on static principles; equal importance must be given to the dynamic forces acting within the denture-bearing area. This technique facilitates the fabrication of an ideal mandibular denture, with the opposing maxillary denture subsequently designed to harmonize with it.[5]

Fish emphasized that the polished surface of a denture is influenced by the surrounding tongue and cheek musculature, which plays a vital role in functions such as speech, mastication, swallowing, and facial expressions. Therefore, complete dentures must be designed to accommodate these functional movements, as physiologically incompatible prostheses can compromise stability, retention, tissue support, and phonetics. Wright and colleagues reported that the mandibular border seal extends inferiorly toward the floor of the mouth and posteriorly into the lateral throat form. Additionally, Rinaldi and Sharry noted that, unlike other oral tissues, the tongues of elderly individuals show minimal

atrophic changes, making it important to record tongue positions during functional movements.

A sound understanding of oral anatomy and physiology enables clinicians to fabricate comfortable and stable dentures while reducing additional appointments required for neutral zone recording.[6]

Conclusion

The neutral zone concept has been advocated for denture fabrication since the 1930s and serves as an alternative approach for constructing complete dentures on severely resorbed ridges. It is particularly beneficial in situations where implant placement is not feasible. The primary objective of this technique is to position the denture within a zone of muscular equilibrium, where muscle activity becomes the main factor contributing to stability and retention during function. Although the technique is relatively straightforward, it requires additional chairside time and increased laboratory effort, which must be taken into consideration.

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