Case Report

JRAD Journal of Research and Advancement in Dentistry

J Res Adv Dent 2020;10:4:226-230.

Neutral Zone Concept for Complete Denture Fabrication: A Clinical Report

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ABSTRACT

Background: The primary objective of the complete denture is retention, stability and support, and these are dependent on so many factors, i.e. the surface area of the denture wearing tissue and the surrounding muscle strength are the most important factor. Long-term edentulism results in a high resorption of the lower edentulous ridge creating problems with the stability of the dentures. The technique of the Neutral Zone is an alternative approach to the construction of a lower complete denture. It is most effective for highly atrophic ridge. This article presents the concept of a neutral zone to be incorporated for the complete denture fabrication for severely resorbed ridges.

Keywords: Stability, support, resorbed ridge, neutral zone concept, Functional moulding technique, complete denture.

INTRODUCTION

Complete Denture Prosthodontics key goals are to restore function, facial appearance and ensure the patient's health.[1]Teeth loss leads to multifactorial mouth changes, such as alveolar ridge resorption, tongue expansion and facial muscle laxity.[2]Highly resorbed mandibular ridges are very challenging for the fabrication of complete dentures. In the mandibular ridge, resorption occurs from the lingual plate providing more space for the movement of the tongue leading to its enlargement, primarily due to the hypertrophy of the intrinsic muscles. On the contrary, the muscles of the cheek and lip lose their tonicity as the age progresses.[3]A variety of methods have also been proposed for the usage of materials in conjunction with movements, including chewing, scraping, whistling and lip pursing. The technique of modeling the plastic impression compound located in the neutral zone, utilizing swallowing as the main modelling function.[4]Different materials that have been suggested for shaping the neutral zone are modelling plastic impression compound, soft wax, a polymer of dimethyl siloxane filled with calcium silicate, silicone, and tissue conditioners and resilient lining materials. The neutral zone is 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.[5]

In patients with compromised support and poor denture adaptability, neutral zone technique is considered to be a valuable tool in the prosthodontic armor, particularly when dental implants are contraindicated or impracticable.[6]The effectiveness of any prosthesis depends on the proper position of the artificial teeth in a neutral zone. Neutral zone is a potential area where the forces generated in the outward direction from the tongue are neutralized or balanced by the inward forces generated by the lips and cheeks during functional activities.[7]Ignorance on the importance

Received: July. 1, 2020: **Accepted**: Sept. 8, 2020
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pISSN 2278-0076
eISSN 2321-9270

of dental position, flange shape and contour leads to poor and unsatisfactory dentures.

This article discusses an innovative approach for achieving optimum preservation, durability and chewing capacity in cases of highly resorbed ridges with neutral zone technique through the simple use of materials available on the chair side of each dental clinician.

CLINICAL CASE REPORT

A 72-year-old male patient registered to the Department of Prosthodontics, Crown and Bridge at Rama Dental College Hospital & Research Centre, Kanpur, with a significant complaint of trouble in chewing, loosening of upper and lower dentures and poor esthetics for the past 10 years. He also complained of denture displacement while chewing. On clinical examination, no gross facial asymmetry seen. The TMJ, muscles of mastication and facial expression were asymptomatic. No gross abnormalities seen on soft tissue of the lips, cheeks, tongue. Severely resorbed upper and lower ridge seen on intra-oral inspection. The goal of this procedure was to rehabilitate the patient with complete denture by identifying the neutral zone and the denture then polished and contoured to ensure optimum prosthetic stability, comfort and efficacy

TREATMENT PROCEDURE

The primary impressions of maxillary and mandibular denture bearing area were made with reversible hydrocolloid impression material (fig.1), maxillary and mandibular impressions were poured in plaster of paris and primary casts were obtained. The custom trays were fabricated with self-cure resin over the primary casts keeping borders 2mm short of the sulcus after applying the separating media. The muscle trimming was achieved with green stick impression compound and the secondary impressions were made with zinc oxide eugenol impression material and master casts were poured in dental stone (fig.2).Maxillary wax rim and a mandibular base plate were constructed on the master cast. A base plate of acrylic without handle, with spurs or fins made with 26 gauge wire attached in anterior and in molar region protruding upwards towards the upper arch (fig.3) was made on mandibular cast. These spurs help in the retention of the low fusing compound. The lower base plate with the softened impression compound in a 65^0 C water bath was placed in the patient's mouth; this plate was very carefully adjusted in the mouth to esure 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. The intrinsic and extrinsic muscle groups were brought into play, moving them along their respective paths of action. In doing so, reciprocating pressures have been exerted upon the compound, which had gradually molded impression compound into a state of neutral balance and become centrally inert in relation to all of the complex forces acting upon it. The neutral zone impression so obtained was placed on master cast(fig.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 (fig.5). The compound occlusal rim was then removed from the base plate and melted modelling wax was poured into that index space (fig.6). 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(fig.7).Once the waxed up dentures were ready, they were checked in the patient's mouth for esthetics, phonetics and occlusion(fig.8).After try in was carried out satisfactorily, the dentures were fabricated, finished and inserted in patient's mouth (fig.10)

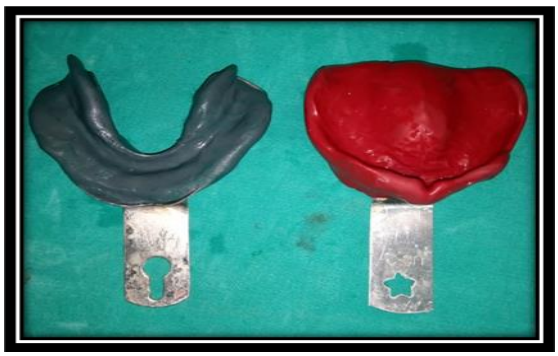

Fig 1: Primary impressions of upper and lower arch with reversible hydrocolloid recorded.

Fig 2: Maxillary and mandibular master casts poured in dental stone.

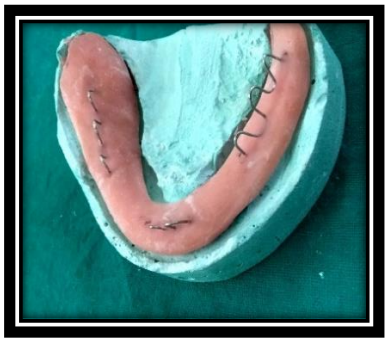

Fig 3: Self cure acrylic base plate was formed and spurs of 26 gauge wire attached in anterior and molar region for retention of impression compound.

Fig 4: Set base plate with impression compound after recording the neutral zone.

Fig 5: Plaster index around the impression with 3 notches.

Fig 6: Impression compound was removed and melted modelling wax poured in the space.

Fig 7: Mandibular denture Try-in checked in neutral zone area by placing the index around the cast.

Fig 8: Try-in of denture in patient mouth.

Fig 9: Final denture inserted in patient's mouth.

DISCUSSION

The main objective of any Prosthodontic treatment is to maintain the form, function and aesthetics of the patient.[7]Simple impression procedures have been followed to ensure maximum retention and stability of the complete denture, particularly on the mandibular ridges.[8,9,10,11] This is a struggle to have stable mandibular dentures for patient's with severely resorbed mandibular ridge. This dilemma will be solved if dentures are made with their contours that harmonize the neutral region. A denture formed by a neutral zone methodology guarantees that the muscular powers function more efficiently in unison and improves the stabilizing capacity of the oral and perioral musculatures.[7,12]Denture fabricated on severely resorbed mandibular ridge by neutral zone impression technique ensures that the muscular forces help in retention and stabilization of the denture to avoid dislodging it during function, it also aids in decreased food lodgement, good esthetics due to facial protection, better alignment of the posterior teeth, allowing ample space for the tongue.[13]Clinicians must recognize and record the neuromuscular structures of the oral tissues and this will be achieved in the development of a conclusive prosthesis that must function within the stabilizing boundary conditions of the neutral zone region.[14]The artificial teeth arrangement within the neutral zone meets two significant objectives:

(1)Prosthetic teeth do not interfere with natural muscle activity.

(2) Normal oral and perioral muscle action provides force against full denture that serve to support and maintain the prosthesis rather than causing denture displacement.

In neutral zone technique posterior denture teeth are oriented slightly facially as compared to teeth arranged over the crest of the residual alveolar ridge which provides more tongue space.[9] In this case study, the whole technique was targeted at utilizing products that have suitable properties that are readily accessible by the chair side therefore, impression compound, green stick compound and ZOE were used as these materials are manipulated easily unlike impression plaster which is messy and cumbersome to use and the fractured fragments of plaster can be swallowed by the patient while executing functional movements.

CONCLUSION

The report points forth an innovative solution to the treatment of entirely edentulous patients with resorbed ridges mainly the mandibular ridge. Recording the neutral zone is a quick, reliable, non-invasive and economic technique. The benefit of neutral zone technique for denture fabrication is that, it stabilizes the denture with the surrounding tissues, instead of dislodging it. In severely atrophic ridges retention and stability are improved. The procedure mentioned is straightforward and utilizes standard products used for denture fabrication, while at the same time eliminating mistakes in achieving the treatment objectives.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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