

## CASE REPORT

### Utilization of Neutral zone technique in complete denture fabrication for a class III sagittal jaw relation patient - A Case report.

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#### ABSTRACT

Long-term denture wearers have advanced ridge atrophy and atrophy of the musculature of the cheeks and lips and often face challenges associated with decreased mandibular denture stability. This case report highlights the successful implementation of the neutral zone technique in the fabrication of maxillary and mandibular complete dentures to address this issue. Understanding the concept of the neutral zone is essential for achieving optimal denture stability, retention, and speech quality. The steps involved in capturing and utilizing the neutral zone to improve denture stability are thoroughly described. The case exemplifies the effectiveness of the neutral zone technique in overcoming mandibular denture instability for patients with compromised edentulous ridges, resulting in enhanced patient satisfaction, improved oral function and speech.

Keywords: complete denture, neutral zone, neuromuscular control, denture stability

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#### INTRODUCTION

Complete dentures are mechanical devices that function within the oral cavity, requiring optimum normal neuromuscular function. In edentulous patients, support to the lips and the cheeks is no longer available and they tend to collapse into the oral cavity.<sup>1</sup> Simultaneously, the tongue will try to expand into the space. Success in treatment with complete dentures is possible in such situations only if the complex and individualized actions of the tongue, lips, cheeks, and floor of the mouth during oral functions is in harmony with complete denture design.<sup>1</sup>

As the natural teeth are lost, a potential denture space is created within the oral cavity. The neutral zone is the area in the potential denture space where the function of the musculature will not unseat the denture and where forces generated by the tongue pressing outward are neutralized by forces of the cheeks and lips pressing inward. Since these forces are developed through muscular contraction during the various functions of chewing, speaking, and swallowing, they vary in magnitude and direction in different individuals.<sup>2</sup>

The correct positioning of teeth and the contour of the external surfaces of the denture play a vital role in ensuring optimal stability and retention. As the alveolar ridge diminishes, the intrinsic support provided by the underlying bone decreases, necessitating greater reliance on the proper

alignment and placement of teeth as well as the contour of the denture surfaces.<sup>1</sup>

Many materials have been suggested for shaping the neutral zone: modelling plastic impression compound, soft wax, a polymer of dimethyl siloxane filled with calcium silicate, silicone, and tissue conditioners and resilient lining materials. Many techniques have also been suggested using the materials in conjunction with movements including swallowing, phonetics, sipping water, licking, smiling, pursing the lips, sucking, masticating, mouth exercises (including tongue movements, blowing, protruding of the tongue, exercise movements of the lips, cheek, and tongue, facial expression, opening and closing) and whistling.<sup>2</sup>

#### CASE REPORT

A completely edentulous 55 years old male patient with severely resorbed mandibular ridge reported in the Department of Prosthodontics, Government Dental college & Hospital, Cuddalore dt. The patient was edentulous for past ten years and denture wearer for past seven years and presented with complaint of ill-fitting lower denture.

#### Intra oral examination:

Clinical evaluation revealed resorbed maxillary ridge and atrophic mandibular ridge (Atwood Order V)3 with an increased interarch space (Fig:1)

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Figure 1: Intraoral photographs of edentulous ridges

#### Clinical Procedure:

##### A.Impression making:

•Primary impression: The primary impressions were made using impression compound Impression Compound; Pyrax polymars, Roorkee, India) and metal stock trays, and the casts were poured using Type II gypsum (Plaster of Paris) (The Ramaraju surgical cotton mills, Perumalpatti, Madurai, India)



Figure 2: Impression compound occlusal rims: a)maxillary, b)mandibular

•Secondary impression: Maxillary and mandibular custom tray was fabricated using a full spacer

design. Border molding was done using low fusing impression compound(DPI pinnacle tracing sticks, Dental products of India, Mumbai, India) and wash impression was made with zinc oxide eugenol impression paste(DPI impression paste, Dental products of India, Mumbai, India).Impressions were poured using Type III gypsum product (dental stone) (Shruti products, Gujarat, India).

##### B.Recording Mandibular neutral zone impression:

Record base was made with self cure acrylic (DPI RR cold cure, Dental products of India, Mumbai, India), and occlusion rims were prepared using modelling compound( Impression Compound; Pyrax polymars, Roorkee, India). (Fig:2)

After a tentative vertical dimension and centric relation have been established, the maxillary and mandibular compound rims were softened in a 65 OC water bath and was placed in the patient's mouth. The patient was asked to carry out different functional movements like swallowing, smiling, puckering and licking the lips. This procedure was repeated several times. After 5– 10 min, the set impression was removed from the mouth and examined.

The dynamics of denture design involve the interplay of internal and external muscle groups, by carrying out different functional movements the muscles are guided along their respective action paths. Through this coordinated movement, reciprocating pressures are exerted upon the denture, gradually shaping it into a state of neutral balance. In this balanced state, the denture becomes centrally inert, effectively interacting with and counteracting the complex forces acting upon it.

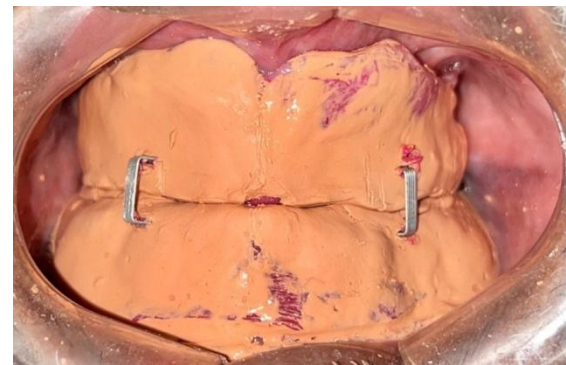


Figure 3: Centric record and final impressions

##### C.Final Impression:

The final impression was made using Zinc oxide eugenol impression paste (DPI impression paste, Dental products of India, Mumbai, India) with a closed- mouth procedure adapted over the impression compound rim at established vertical dimension and moulded by asking the patient to do actions like pucker the lips forward, smile broadly, open the mouth, and move the mandible from side to

side. After the final impressions were completed, the centric relation was finally determined (Fig:3). The neutral zone impression obtained was placed on the master cast and a silicone putty (Photosil soft putty, Dental products of India, Mumbai, India) index was adapted around the impression on both the labial and lingual sides (Fig:4).

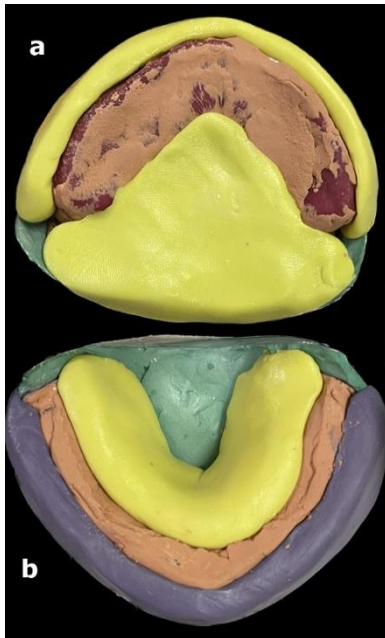


Figure 4: Silicone putty index adaptation on the occlusal rims a)maxillary,b)mandibular



Figure 5: Teeth setting with the help of silicone putty index a)maxillary,b)mandibular

**D. Teeth setting and Try in:**

The compound occlusal rims were then removed from the base plate and molten modelling wax was

flowed into the space created between the index that will take the shape of the moulded occlusal rim in neutral zone. The position of the acrylic teeth (Premadent teeth set cross linked acrylic teeth, Ashvin, India) was checked by placing the index together around the wax try-in. (Fig:5).The waxed up dentures were checked in the patient’s mouth for esthetics, phonetics and occlusion



Figure 6: Intraoral view of new and old complete dentures

**E. Denture Insertion:**

After completion of try-in, denture fabrication was done in heat cure acrylic resin. Finished and polished complete denture was inserted in patient’s mouth after doing minor occlusion correction Post denture instructions given to the patient. Figure:6 illustrates the difference between old (conventional complete denture) and new (neutral zone denture) intraorally. Figure:7 exhibits the difference between old (conventional complete denture) and new (neutral zone denture) extraorally.

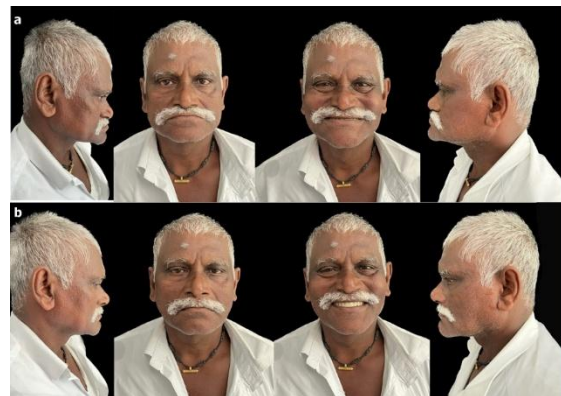


Figure 7: Extraoral view of patient with new and old dentures dentures



## DISCUSSION

Sir Wilford Fish of England has identified three surfaces of a denture: the occlusal surfaces, the impression surface, and the polished surface<sup>1</sup>. The impact of ridge loss is highlighted, with greater ridge loss resulting in a smaller denture base area and reduced influence of the impression surface on stability and retention. As the impression surface area decreases and the polished surface area increases, the importance of tooth position and contour of the polished surface becomes more crucial.<sup>2,4</sup> When the occlusal surfaces of the teeth are not in contact, denture stability relies on the fit of the impression surface and the direction and strength of forces transmitted through the polished surfaces. To ensure optimal functionality in activities like chewing, swallowing, and speaking, it is essential to meticulously develop accurate tooth position as well as the fit and contour of both the impression and polished surfaces. Maxillary and mandibular ridge resorption creates more space for tongue movement and can lead to tongue enlargement over time. Moreover, as we age, the cheek and lip muscles lose their tonicity, causing the neutral zone to shift towards the buccal and labial sides.<sup>5,6</sup> To enhance denture stability, it is crucial to accurately record and consider this zone.

In this case report, the focus is on the impact of neuromuscular action on both upper and lower complete dentures. The technique used in the fabrication of these dentures aims to harmonize with the individual's neuromuscular dynamics, ensuring proper denture contours and tooth positions. This comprehensive approach prioritizes optimal denture function and comfort for the patient.

## CONCLUSION

In cases of substantial resorption of the residual alveolar ridges, the proper positioning of teeth and the external contour of dentures play a crucial role in determining denture stability and retention. Incorporating the neutral zone technique proves to be a pragmatic approach that contributes to achieving these objectives. This method introduces just one additional clinical step to the conventional denture-making process, which is straightforward to implement.

## CONFLICT OF INTEREST

There is no conflict of interest

## ACKNOWLEDGEMENT

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