

Neutral Zone Impression Technique for Mandibular Compromised Ridges: A Case Report

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ABSTRACT

Masticatory function requires a unique coordination with muscles and oral structures. If the denture is placed in a zone where the displacing forces of tongue, lips, cheeks and modulus are balanced, then the denture will be retained more effectively during function. This zone is known as neutral zone. If the denture strays outside / inside the neutral zone it will be unstable during the activities such as talking, swallowing and mastication. The neutral zone technique is used to minimize the displacing forces of the surrounding structures. This is a case report in which neutral zone impression technique was used to solve the problem of denture instability.

KEYWORDS: Instability, Atrophic Ridge, Muscle Function, Neutral Zone

INTRODUCTION

The life expectancy of the Indian population is steadily increasing, which could lead to a rise in the number of complex complete denture cases.¹ The Stability of mandibular complete denture is a difficult treatment aim to achieve because of the continuous reduction of residual ridge size and its proximity to limiting structures. The traditionally used technique serves an excellent role in most of the cases except in cases where the residual ridge resorption has led to highly atrophic ridge. As the area of the impression surface decreases (due to alveolar ridge resorption), denture retention and stability also decreases, Consequently retention and stability becomes more dependent on correct positioning of the teeth and the contours of the external or polished surface of the dentures. Therefore these surfaces should be so contoured that horizontally directed forces applied by the peridure muscles should act to seat the denture in well balanced muscular space known as neutral zone. Sir Wilfred Fish of England described neutral zone concept in 1931. The neutral zone is defined as

the potential space between the lips and cheeks on one side and the tongue on other, that area where forces between the tongue and cheeks or lips are equal.²

Dental implant stabilizes the denture fabricated over atrophic mandibular ridge. However, there may be certain medical, surgical or economic conditions when it is not possible to provide implants. In such complex cases the neutral zone impression technique is the only option left for the stabilization of the complete denture. It is not only a treatment of choice in atrophic mandible but also in patients with partial glossectomy, mandibular resections or motor nerve damage to the tongue which have led to either atypical movement or an unfavourable denture bearing area. Neutral Zone Technique is advocated as an alternative method of complete denture construction in poorly resorbed ridge.³ The technique is not new but is one that is valuable and yet not often practiced. This present article describes the fabrication of a complete denture using neutral zone impression technique for enhanced stability and masticatory efficiency.

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CASE REPORT

A 68 years old male patient reported to the OPD of Azeezia Dental College of dental science and research, Kollam with the chief complaint of loose mandibular complete denture. Patient had been edentulous for the past 20 years. Patient had two sets of complete dentures which made earlier and with both the dentures patient had the problem of instability of mandibular denture.

Intra oral examination revealed completely edentulous maxillary and mandibular arch, extremely strong mentalis and buccinator muscle which on activation led to narrowing of labial and buccal sulcus. The mandibular ridge was in order V, muscle attachments were higher and close to the residual ridge [Fig1]. Critical examination of previous denture showed the posterior teeth were positioned lateral to the crest of the ridge. The mandibular occlusal plane was also higher further adding to instability of mandibular denture. It was therefore decided to use neutral zone impression technique to determine the optimum position of teeth and contour the polished surfaces of denture in harmony with the surrounding musculature.



Fig 1 : Edentulous Maxillary And Highly Resorbed Mandibular Ridge

Preliminary And Secondary Impressions: The preliminary impressions were made in stock tray with a mucocompressive material, impression compound [Fig.2].

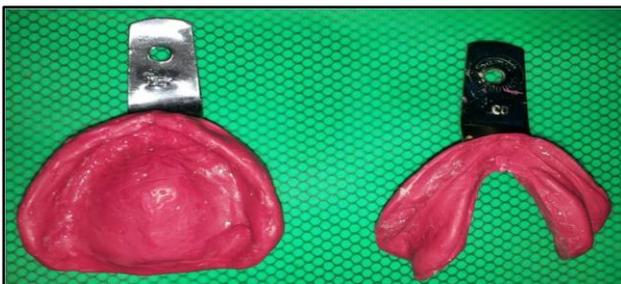


Fig 2 : Maxillary And Mandibular Primary Impression

The secondary impression was made in special tray with low viscosity mucostatic zinc oxide eugenol material. [Fig.3]



Fig 3 : Final Impressions

Jaw Relation: The occlusal rims were made on heat cured acrylic record denture bases for increased stability. The permanent record base was assessed for extension, comfort and stability. The maxillary occlusal rim was shaped properly to provide good support for the musculature labially and buccally. Orientation, centric relations were recorded and transferred to Hanau semi adjustable articulator using face bow.



Fig 4 : Face Bow Transfer And Articulation

Modification of Mandibular Record Base: Mandibular occlusal rim was completely removed and wire loops were attached over the record base in accordance with recorded vertical height. Maxillary occlusion rim and modified mandibular record base with wire loops were evaluated intra orally for their fit & ensured that loops do not interfere with muscle movement during function [Fig 5]. Maxillary rim was left in mouth in order to provide enough support to the facial musculature during making neutral zone impression

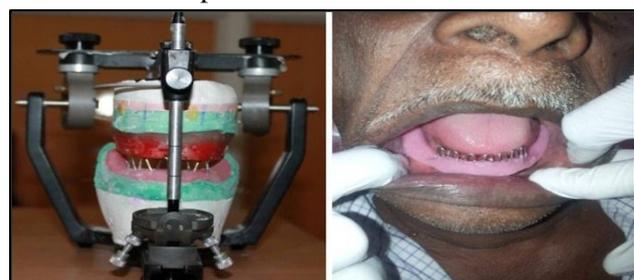


Fig 5 : Modified Mandibular Denture Base

Neutral zone impression: Before making the neutral zone impression, the patient was made comfortable in an upright position with the head unsupported. Maxillary wax rim was inserted in the mouth and reassessed for support & occlusal plane. The impression compound and green stick in ratio 3:7 (DPI) was softened in a 65°C water bath. The softened compound was kneaded and a roll was formed according to the crest and was adapted to retentive loop at established vertical dimension. 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. These actions molded the material by muscle activity. After 10mins, the set impression was removed from the mouth [Fig 6]. The neutral zone impression so obtained was placed on the master model, locating grooves were cut on the master cast and was covered with a silicone putty index around the impression on both the labial and lingual sides [Fig.7].



Fig 6 : Completed Neutral Zone Impression



Fig 7 : Orientation Grooves And Silicone Putty Indexing

The compound occlusal rim was then removed from the base and the index is replaced. The index would have preserved the space of the neutral zone. Teeth arrangement was done exactly following the index

[Fig.8]. The position of the teeth was checked by placing the index together around the wax try in.



Fig 8 : Selecting and arranging the teeth in accordance with the putty index

Completion of Denture: The waxed up dentures were placed in the mouth and patient was asked to repeat all the movements previously mentioned. The denture was stable after all the movements. Aesthetics, phonetics and occlusion were assessed. The dentures were then processed as a conventional denture. Finishing and polishing of denture was done carefully so that the contour of the polished surfaces remained unaltered. On insertion of denture, minor occlusal discrepancies were corrected [Fig.9]. Dentures provided enhance the appearance, retention and stability during function because they are in harmony with their surrounding musculatures [Fig 10].



Fig 9

Fig 10

Fig 9: Post denture insertion, Fig 10: Checking the stability of denture

DISCUSSION

The ultimate goal of prosthodontic treatment is to restore the function, form, and esthetics of the patient. Fish pointed that out of three surfaces of the denture, the polished surface is bounded by the tongue and the cheeks.⁴ Dentures are involved in normal physiologic movements such as mastication, smiling, swallowing, speech, and swallowing. Hence, the denture should be in harmony with these functions because physiologically unacceptable

denture is responsible for poor prosthesis stability and retention, insufficient facial tissue support, less tongue space and compromised phonetics.⁵⁻⁷ Denture fabricated over a severely resorbed mandibular ridge by neutral zone impression technique will insure that the muscular forces aid in retention and stabilization of the denture rather than dislodging the denture during function.^{8,9} The dentures will also have other advantages such as reduced food lodgement, good esthetics due to facial support, proper positioning of the posterior teeth which allows sufficient tongue space.¹⁰ Clinicians must identify and record the neuromuscular dynamics of the oral tissues and this should be applied in the construction of the definitive prosthesis that will exist within the stabilizing boundary conditions of the neutral zone area.

CONCLUSION

With advancement in dental material science and development of newer techniques in prosthodontics, the neutral zone impression technique may be incorporated into fabrication of any complete denture. Though this is indicated for patients with severe residual ridge resorption, the procedures discussed can also be used for full mouth rehabilitation of edentulous patients with dental implants.

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