

Neutral Zone Technique for Complete Denture Fabrication in Severely Resorbed Maxillary and Mandibular Ridge: Case Report

Shantanu Mulay^{1*}, Chetan Modgi², Gulab Baid³, Bhagyashri Mulay⁴

¹Department of Prosthodontics, SMBT Dental College, Sangamner, Ahmednagar, Maharashtra, India,

²Department of Prosthodontics, Sinhgad Dental College and Hospital, Pune, Maharashtra, India,

³Department of Prosthodontics, Maitri College of Dentistry and Research Centre, Anjora, Chhattisgarh, India,

⁴General Dental Practitioner, Pune, Maharashtra, India.

Abstract

Background: Complete denture fabrication in complex cases such as resorbed ridge condition is challenging for most dental practitioners. The basic expectation of an edentulous patient is a prosthesis that has maximum functional efficiency, stability, retention, esthetics, and comfort. The success of the prosthesis depends on up to which extent the practitioner could achieve these expectations. Implant-supported overdentures may help in such cases; however, it is not possible in patients with compromised medical, surgical, and economic conditions. In such cases, one has to select a technique different from the traditional denture construction technique to have a favorable prognosis for the denture. The impression technique selected should be based on the present state of the basal tissue support. This case report presents the application of the neutral zone concept being incorporated in to impression making in an effort to achieve successful complete denture in case of severely resorbed mandibular ridge.

Keywords: Complete denture, Resorbed ridge, Neutral zone, Denture stability.

INTRODUCTION

Complete dentures are primarily mechanical devices functioning in the oral cavity. They must be fashioned in such a way that they are in harmony with normal neuromuscular function. All oral functions such as speech, mastication, swallowing, smiling, and laughing involve the synergic actions of the tongue, lips, cheeks, and the floor of the mouth, which are very complex and highly individual. The coordination of complete dentures with neuromuscular function is the foundation of successful, stable dentures.^[1]

The neutral zone is defined as “the potential space between the lips and the 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.”^[2]

The eruption of the teeth in the oral cavity is influenced by the forces exerted by tongue, cheeks, and lips. The neutral zone determines the position of each tooth and establishes the dimensions of the entire arch, including the shape, and position of the alveolar processes.^[3] This muscular environment continues throughout life, even after teeth have been lost and greatly influences this potential space.

Regardless of the method of treatment, any part of the dentition out of harmony with the neutral zone will result in instability, interference with function, or some degree of discomfort.^[3] The success of denture prosthesis depends on the proper positioning of artificial teeth within the neutral zone. Failure to recognize the importance of tooth position, flange form, and contour often results in dentures which are unstable and unsatisfactory.

Historical background

Sir Wilford Fish first described the influence of the polished surfaces on retention and stability and also described how dentures should be constructed in the “dead space,” which later became known as a neutral zone.^[4] The landmark work regarding the limiting effect on arch size was done by Sidney Frederick.^[3] Many others, including Perry and the Detroit

Address for correspondence: Dr. Shantanu Mulay,

Department of Prosthodontics, SMBT Dental College, Sangamner, Ahmednagar, Maharashtra, India. Email: drshantanu.mulay@gmail.com

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Dental clinic club, have helped to advance and develop both the theoretical basis and practical procedures.^[5]

Searching the literature, neutral zone technique is found to be used in the following clinical situations;

- 1 Severely atrophic mandibular ridge
- 2 Patients with prominent and highly attached mentalis muscle, lateral spreading of tongue
- 3 Patients with diminished neuromuscular control
- 4 Patient with atypical shape or consistency of oral and perioral structures.

This case report describes a neutral zone impression technique approach for fabricating a complete denture with enhanced stability and masticatory efficiency for a patient with severely resorbed maxillary and mandibular ridge.

CASE REPORT

A 67-year-old female patient reported to our department with the chief complaint of difficulty in chewing due to missing teeth and asked for her lost teeth to be replaced. On intraoral examination it was found that both the maxillary and mandibular arches were completely edentulous with severely resorbed alveolar ridges.

Diagnostic impression

Maxillary and mandibular primary impressions were made using impression compound (DPI). The impressions obtained were poured using dental plaster (Type II) so as to get the primary casts. Special trays were fabricated over the primary casts and maxillary and mandibular border molding was done using low fusing compound (DPI).

Secondary impression of maxillary arch recorded by zinc oxide eugenol impression material (DPI) (Figure 1), secondary impression of mandibular arch recorded using “Hobkirk technique.” In this technique, secondary impression of mandibular arch is recorded using Regular body (Aquasil, Dentsply) first, then anterior region of recorded impression scraped and this scraped anterior region was again recorded using light body (Aquasil, Dentsply) (Figure 2). The obtained impressions were poured with dental stone (Type III) for secondary casts.

Registration of Tentative Jaw Relations and Preparing Acrylic Stops: Then, record bases and occlusal rims were fabricated. The patient is made comfortable in an upright position with the head supported, and jaw relation recorded (Figure 3). Then, this jaw relation is transferred to an articulator. Then, clear acrylic stops were made in between the occlusal rims (Figure 4). Occlusal rim wax in between the acrylic stops is removed using wax knife and carver. Then wire was incorporated in between the stops so as to support softened mixture of low fusing impression compound (green stick) and impression compound (Figure 5).

Registration of compound rim

Mixture of impression compound and green stick compound was softened in a hot water bath. The softened compound

was kneaded and a roll was formed and placed according to the acrylic stops and incorporated wires on record base. The attached roll of mixture was reheated in the water bath and

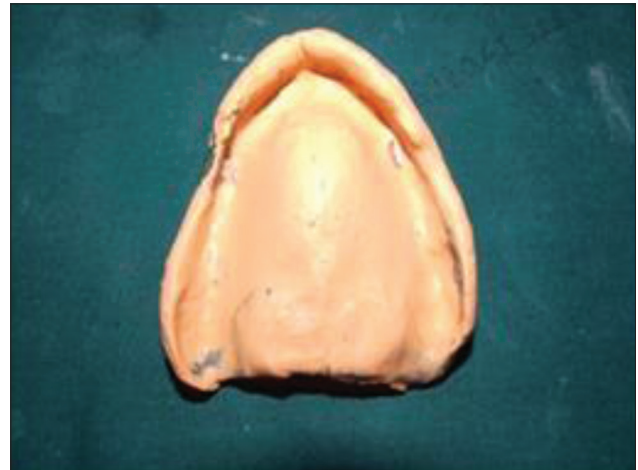


Figure 1: Maxillary secondary impression using ZOE impression material



Figure 2: Mandibular secondary impression using HOBKIRK technique



Figure 3: Jaw relation

carried into the patient's mouth. With the record base firmly seated, the patient was asked to perform a series of functional movements such as swallowing, speaking loudly, sucking, pursing lips, pronouncing vowels, and slightly protruding the tongue several times which simulated physiological functioning. During function of the lips, cheeks, and the tongue, the forces exerted on soft compound mold it into the shape of the neutral zone. After a few minutes, when the compound has cooled, the record base with compound rim is removed and placed in cold water bath (Figure 6).

Preparation of Plaster Index and Occlusal Wax Rim: Once these compound rims were cooled, these rims were indexed by plaster (Figure 7). After indexing, compound rims were dewaxed. The empty space created by dewaxing was filled by pouring molten wax into space to obtain occlusal wax rims for maxillary and mandibular arch (Figure 8). These maxillary and mandibular occlusal wax rims obtained by neutral zone impression technique were transferred to articulator and teeth arrangement done. Teeth arrangement is done exactly following the obtained occlusal wax rims.

Esthetic try-in and evaluation of neutral zone

Once the waxed up trial dentures were ready, they are checked in the patients mouth for esthetics, phonetics, and occlusion (Figure 9). Further, they were evaluated for neutral zone in the patient's mouth using zinc oxide eugenol impression paste (Figure 10). Zinc oxide eugenol impression paste (DPI) was applied on the buccal and labial aspect of the upper denture and buccal, labial, and lingual aspect of the lower denture. Then, these trial dentures were placed in the mouth. Patient was asked to make swallowing, sucking, and other functional movements. When all the considerations are fulfilled, the denture is processed, finished, polished, and finally insertion was done (Figure 11).

DISCUSSION

The ultimate goal of any prosthodontic treatment is to restore the form, function, and esthetic of the patient. Sir Wilford Fish has described a denture as having three surfaces, namely, impression, occlusal, and the polished surface with each surface playing an important role in the overall fit, stability, and comfort of the denture.^[1]

There are many techniques described in the literature to record the neutral zone. The principle of neutral zone concept remains the same whichever technique used. The technique used here is very simple. The materials used in this particular case are, impression compound (DPI), low fusing compound/green stick (DPI), modeling wax (DPI), self-cure acrylic (ASIAN ACRYLATES), zinc oxide eugenol impression paste (DPI), silicone impression materials (DENTSPLY), dental plaster (KALABHAI), and dental stone (KALABHAI). Medium viscosity of the mixture of impression compound and green stick helps in recording neutral zone more accurately.

The greater the ridge loss, the smaller the denture base area and the less influence the impression surface area will have on the



Figure 4: Acrylic stops made in between occlusal wax rims



Figure 5: Wax has been removed and wire incorporated in between acrylic stops



Figure 6: Impression recorded by functional movements in patient's mouth

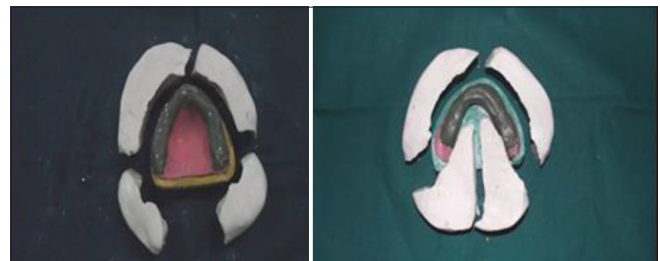


Figure 7: Plaster index for maxillary and mandibular arch

stability and retention of the denture. As the area of impression surface decreases and the polished surface area increases. In severe ridge resorption cases, the influence of tooth position and

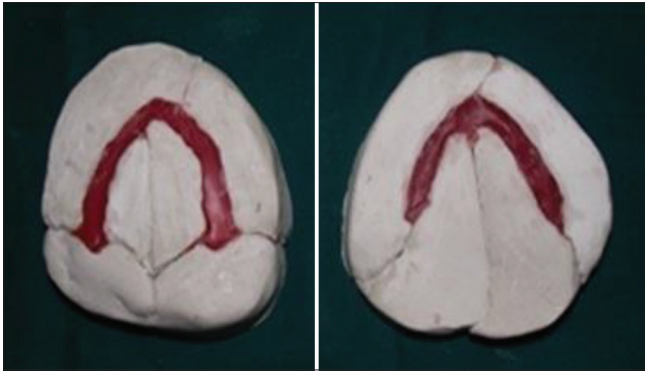


Figure 8: Added molten wax into space created by dewaxing



Figure 9: Try-in



Figure 10: Evaluation for neutral zone using ZOE

flange contour on denture stability is equal or greater than that of any other factor. Teeth should be placed as dictated by the musculature, and this will vary for different patients. Positioning artificial teeth in neutral zone achieves two objectives. First, the teeth will not interfere with the normal muscle function, and second, the forces exerted by the musculature against the dentures are more favorable for stability and retention.^[1] The neutral zone technique is most effective for patients who have had numerous unstable, unreceptive dentures. A denture shaped



Figure 11: Denture insertion

by the neutral zone technique will ensure that the muscular forces are working more effectively and in harmony. These dentures will have other advantages:^[5-8]

- Improved stability and retention
- Posterior teeth will be correctly positioned allowing sufficient tongue space
- Reduced food trapping adjacent to the molar teeth
- Good esthetics due to facial support.

CONCLUSION

The neutral zone impression technique may be incorporated into fabrication of any complete denture prosthesis when the patient presents with highly resorbed alveolar ridge. This case report highlights one such case where a successful denture was fabricated using this impression technique.

CONFLICTS OF INTEREST

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

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