

Case Report

NEUTRAL ZONE –A CLINICAL CASE REPORT

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ABSTRACT

Long term denture wearers often pose a problem due to lack of stability of their mandibular complete dentures because of high resorption of lower edentulous ridge. It is the duty of a prosthodontist to rehabilitate those patients to near normal function, irrespective of the clinical picture. This paper presents neutral zone technique in a functional approach to overcome the problem of instability of lower dentures caused in patients by a more potential musculature or in patient who have dimensional or altered neuromuscular control.

Keywords: *Neutral Zone, Poor Neuromuscular Coordination, Over Musculature*

INTRODUCTION

Attaining the stability in lower complete denture is recognized as a most difficult treatment objective in patients who have highly resorbed lower edentulous ridges. These patients frequently complain about the looseness and discomfort caused by their mandibular complete dentures which is a difficult task for a prosthodontist to manage it. An unstable mandibular complete denture may occur due to various causes: Incorrect extensions of buccal or lingual flanges. Poorly adapted fitting surfaces. Atrophic mandibular ridge. Inappropriate contoured polished surface (Ahmad and Nixon, 2011).

The key determinant of stability of lower complete denture is the neuromuscular control of the patient. Size and position of prosthetic teeth and the contours of polished surface have a crucial role in lower complete denture stability as they are subjected to destabilizing forces from the tongue, lips and cheeks if they are placed in hindrance with function of these structures (Ahmad and Nixon, 2011).

Many concepts and theories emerged to describe where prosthetic teeth of complete denture should be positioned. Some of them adopted mechanical principles, others used biometric guides and a minority advocated mathematical formulas based on natural teeth position and dimensions (Lammie, 1956; Pound, 1951; El-Gheriani, 1992). These arbitrary approaches have been challenged and found insufficient, in fact not only by rigorous research, but also by failure to restore function, aesthetics and comfort in patients with severely atrophic mandibular ridges, patients with enlarged tongue and cases of marginal or segmental mandibulectomy. This problem can be overcome by advocating the neutral zone technique (Atwood, 1963).

There are various terms used to describe this potential area where the outward forces generated by the tongue are balanced or neutralized by the inward forces generated by lips and cheeks during functional activities, they are neutral zone, zone of minimal conflict, zone of equilibrium, potential denture space and the dead space. Setting teeth and contouring polished surface of lower complete denture within this zone, makes the prosthesis less subjected to dislodging forces and adds to more stability. If we fail to notice the importance of tooth position, flange form and contour it often results in dentures which are unstable and unsatisfactory (Mathews, 1961; Grant and Johnson, 1983; Roberts, 1960; Fish, 1933).

Dental implants placed with neutral zone technique stabilize the denture fabricated over atrophic mandibular ridge. However, there may be certain medical, surgical or economical 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. Indications: Severely atrophic mandibular ridge. Patients with prominent and highly attached mentalis muscle, lateral spreading of tongue as a result of poor transition from dentate to edentulous state and severe resorption.

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Patient with diminished neuromuscular control such as those with a history of stroke, Parkinson's disease or patients with impaired motor innervations to oral and facial muscles as a result of brain surgery. Patients with atypical shape or consistency of oral and perioral structures. For example, patients who have scleroderma, marginal or segmental mandibulectomy and partial glossectomy. Neutral zone technique can be used to locate optimal position for implants in cases of implant supported or retained over dentures, which enhances the overall outcome of the treatment (Lynch, 2006; Memarian, 2011; Makzoume, 2008; Kumar, 2010).

CASES

A 60 yrs old female patient reported to the department of Prosthodontics with the complaint of missing teeth and wanted the replacement of the same. On examination it was found that both upper and lower arches were edentulous and lower ridge was severely resorbed. (**Figure 1**) Patient also gave a history of denture wearing since last 8 years but the previous lower denture was broken. Treatment planning included fabricating the complete denture with the help of neutral zone technique and patient was explained about the same. Primary impressions were made using a high viscosity irreversible hydrocolloid impression material. The secondary impressions were made in a close fitting tray with zinc oxide eugenol impression material. During recording of secondary impressions the patient was asked to open, swallow and speak so as to bring all muscles into function. The obtained impressions were poured with dental stone. The record bases were fabricated, assessed and modified for stability extension and comfort. Jaw relations were recorded as in conventional treatment. Master casts with record blocks should be mounted on an articulator.



Figure 1: Edentulous maxilla and mandible

In the lab, the lower occlusal rim is removed from base plate and substituted with a base plate with acrylic pillars in premolar and anterior region. We can also use wire loops to retain the impression material on the base plate (**Figure 2A and 2B**). The pillars preserve the VDO recorded during jaw relations, before making the neutral zone impression; the patient was made comfortable in an upright position with the head supported. The impression compound and green stick compound were mixed in 3:1 ratio in a 65⁰C water bath to modify the viscous property, the softened compound was kneaded and a roll was formed according to the crest and was attached to the base. The attached roll of compound was reheated in the water bath and was carried into the patient's mouth.

With the recording 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 tongue several times which simulated physiological functioning. During function of the lips, cheeks and the tongue, the force exerted on the soft compound molds it into shape of neutral zone (**Figure 2C**). After a few minutes when the compound has cooled, the record base with the compound rims removed and placed in cool water bath. The height of the lower compound rim was adjusted with a BP blade

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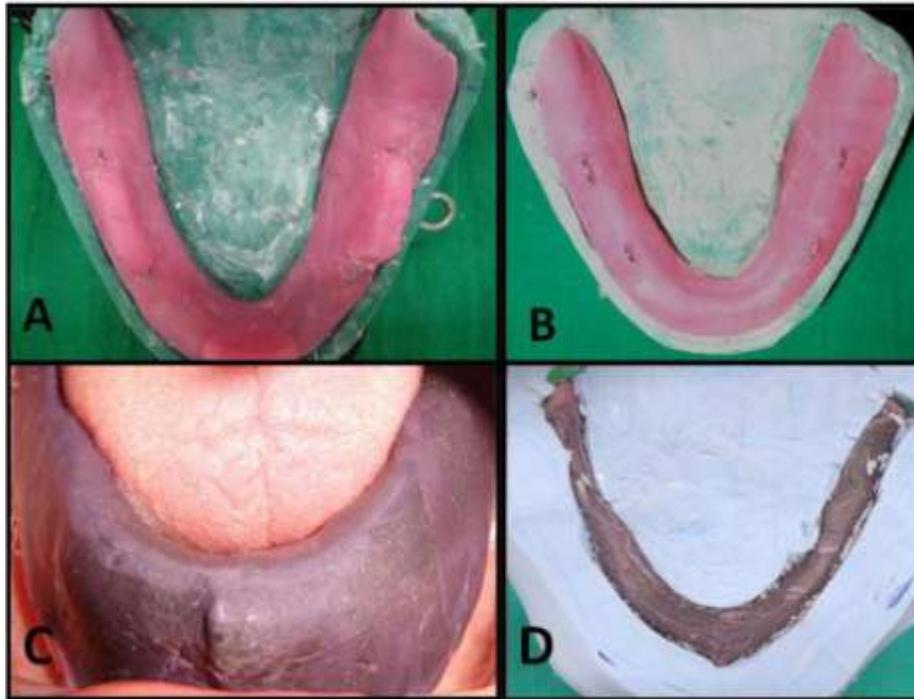


Figure 2: A- Mandibular denture base with acrylic stops. B- Mandibular denture base with wire loops. C- Shape of the neutral zone recorded in the patient's mouth. D- Silicone putty index around the impression

The neutral zone impression so obtained was placed on master model, location 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 (**Figure 2D**). The compound occlusal rim was then removed from the base plate and the index is again replaced neutral zone space can be preserved using putty index and teeth were arranged exactly following the putty index. The position of the teeth was checked by placing the index together around the wax try-in. Once the waxed up dentures were ready, they were checked in the patient's mouth for esthetics, phonetics and occlusion (**Figure 3A**). Once the try in was deemed satisfactory, the dentures were processed and finished (**Figure 3B & C**).

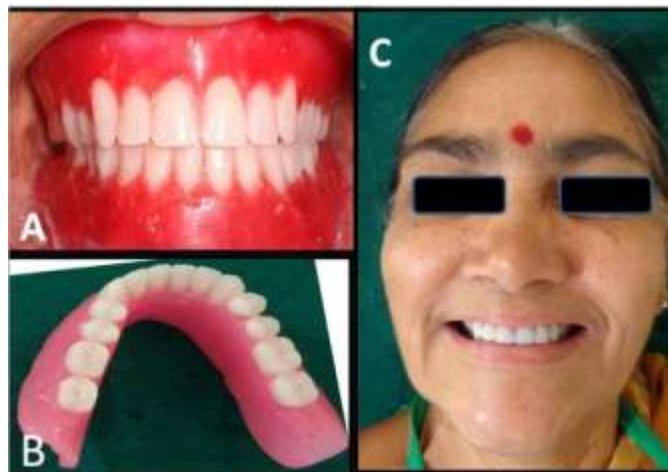


Figure 3: A- Wax trial in the patients mouth. B- Finished denture. C- Post operative view of the patient

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DISCUSSION

The ultimate goal of any prosthodontic treatment is to restore the form, function and esthetics of the patient. Fish pointed that out of the three surfaces of the denture the polished surface is bounded by the tongue and the cheeks (Fish, 1947). These are involved in normal physiological movements such as speech, mastication, swallowing, smiling and laughing.

Hence, the fabrication of the denture must 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. Denture fabricated over 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 (Fahmi, 1992).

The dentures will also have other advantages such as reduced food lodgment, good esthetics due to facial support, proper positioning of the posterior teeth which allows sufficient tongue space. Clinicians must identify and record the neuromuscular dynamics of the oral tissues and this should be applied in the construction of the definitive prosthesis.

Conclusion

Neutral zone concept is considered as exceptionally important when considering treatment options for patients complaining from unstable lower CD particularly if implant treatment is not feasible. Though this is indicated for patients with severe ridge resorption, the procedures discussed can also be used for full mouth rehabilitation of edentulous patients with dental implants.

REFERENCES:

- Ahmad A and Peter J Nixon (2011).** Neutral zone in complete dentures: Systematic analysis of evidence and technique. *Smile Dental Journal* **6**(4) 8-12.
- Atwood Da (1963).** Post extraction changes in the adult mandible as illustrates by microradiographs of mid saggital sections and serial Cephalometric roentgenograms. *The Journal of Prosthetic Dentistry* **13**(5) 810-24.
- El-Gheriani AS (1992).** A New guide for positioning of maxillary posterior denture teeth. *Journal of Oral Rehabilitation* **19**(5) 533-8.
- Fahmi F (1992).** The position of the neutral zone in relation to the alveolar ridge. *The Journal of Prosthetic Dentistry* **67**(6) 805-9.
- Fish E (1933).** Using the muscles to stabilize the full lower denture. *The Journal of the American Dental Association* **20** 2163.
- Fish EW (1947).** An analysis of the stabilizing force in full denture construction. *British Dental Journal* **83** 137- 42.
- Grant AA and Johnson W (1983).** *An Introduction to Removable Denture Prosthetics* (C. Livingstone).
- Lammie G (1956).** Aging changes and the complete lower denture. *The Journal of Prosthetic Dentistry* **6** 450-64.
- Lynch CD (2006).** Overcoming the unstable mandibular complete denture: The neutral zone impression technique. *Dental Update* **33** 21-6.
- Makzoume JE (2008).** Complete denture prosthodontic for a patient with Parkinson's disease using the neutral zone concept: a clinical report. *General Dentistry* **56** 12-16
- Memarian L (2011).** Using neutral zone concept in prosthodontic treatment of a patient with brain surgery: A Clinical Report. *Journal of Prosthodontic Research* **55**(2) 117-20.
- Pound E (1951)** Esthetic dentures and their phonetic values. *The Journal of Prosthetic Dentistry* **1** 98-11.
- Pravin Kumar GP (2010).** Conventional complete denture for a left segmental mandibulectomy patient using a modified neutral zone concept: A clinical report. *Journal of Prosthodontic Research* **56**(4) 12-6.
- Roberts A (1960).** The effects of outline and form upon denture stability and retention. *Dental Clinics of North America* **4** 293-303.