

# Complete Denture in Neutral Zone: Case Report

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## ABSTRACT

Fabrication of complete dentures using the neutral zone technique is neither recent nor original. During the past few decades, many articles which have incorporated or related to what we have named the “neutral zone technique” have been published. The aim of this case report is to describe the technique to fabricate a mandibular complete denture in muscular balance, as muscular control will be the major stabilizing and retentive factor during function. The neutral zone technique is fairly easy to perform but requires an extra visit and relatively high laboratory costs. This article elaborates on a case of a 42 years old female patient with mandibular atrophic ridge treated by utilizing the neutral zone technique.

**Keywords:** Atrophic residual ridges, Mandibular complete denture, Stability, Tissue conditioner.

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## INTRODUCTION

The major goals of providing complete denture prosthesis to an edentulous patient include the provision of functionally aesthetic substitutes and the replacement of associated structures within the oral cavity<sup>1</sup>.

General dental practitioners and prosthodontists alike usually encounter problems when making complete dentures for patients with atrophic residual ridges<sup>2</sup>. This problem is commonly encountered in mandible<sup>3</sup> and it is difficult to achieve retention and stability in mandibular dentures as compared to the maxillary ones. Unstability in mandibular complete dentures may be present due to a number of reasons. The common ones, as described by Jagger & Harrison<sup>4</sup> are:

- a) Inappropriate extensions of buccal and lingual flanges of a denture;
- b) Poorly adapting denture fitting surface;
- c) Severely atrophic mandibular alveolar ridge;
- d) Poorly contoured polished surfaces of a denture;
- e) Abnormal denture teeth positions, inappropriate orientation and high level of the occlusal plane and presence of occlusal errors.

The neutral zone, also known as zone of minimal conflict, exists between the buccal and lingual musculature within which the polished surfaces of a denture should be ideally placed<sup>5,6</sup>. It is defined as that region in the mouth where forces produced by the tongue directed outward are balanced by inward forces originating from the cheeks and lips during normal neuromuscular function<sup>7</sup>. Throughout oral function, various muscles and structures are involved. The main displacing forces which add to the instability of mandibular denture are generated by the tongue, the lower lip and the modiolus<sup>8</sup>. Positioning teeth in the neutral zone ensures that the artificial teeth will not interfering with the normal muscular function of the oral cavity and that those forces which are generated by the oral musculature are more favourable for the stability of the denture. Thus, a denture fabricated using the neutral zone technique will have better retention, stability and aesthetics due to good facial support.

## CASE REPORT

A 42 year old female patient reported for fabrication of upper and lower complete dentures. The patient had been edentulous for the past 3 years and had worn 2 sets of complete dentures previously. The dentures that the patient was

currently using were recently fabricated. Her chief complaint was of an ill-fitting mandibular denture. The lower denture showed signs of poor retention and stability due to poor tissue adaptation and base extensions. The dentures were also over extended Bucco-lingually which was affecting patient's speech. Occlusal plane levels of the dentures were also inadequate and so was the position of the posterior teeth. An intra oral examination was carried out and no abnormality was observed in the mucosa and in the areas surrounding the potential denture peripheries. Her maxillary denture had reasonable retention and it was decided that this prosthesis should be replaced to further improve its retention and stability and also to improve the occlusion. Examination of the mandibular denture bearing area revealed slight lateral spreading of the tongue and a severely resorbed mandibular alveolar ridge (Atwood class V)(Figure 1). It was decided that a new mandibular denture would be provided to the patient using the neutral zone impression technique so that the retention and stability of the dentures could be improved. Option of an mandibular implant retained over denture was given to the patient but the patient could not afford the expense of the treatment.



**Figure 1: Pre op**

A step by step procedure regarding the treatment is outlined with reference to various clinical and laboratory stages:

**a) Initial & Final Impressions:**

Primary impressions of the upper and lower arches were recorded with alginate (Cavex Holland, BV) using metallic stock trays. Primary models were poured in the laboratory and closed fitting upper and lower custom trays were fabricated using self-cure acrylic resin. The extensions of the custom trays were evaluated intra-orally and upper and lower secondary impressions were recorded using zinc-oxide eugenol impression paste (Cavex Holland, BV). The master casts were poured in the laboratory and upper and lower base plates were fabricated using heat-cure acrylic resin.

**b) Bite Registration:**

The extensions, retention and stability of the base plates were accessed intra orally. Wax blocks were made over upper and lower base plates and conventional occlusal registration was recorded. The height of the wax blocks were adjusted intraorally to permit an acceptable occlusal vertical dimension (OVD) and a 2mm of freeway space. Centric relation was recorded and articulation done. The mandibular wax block was removed and was replaced with wire loops which were then attached to the base plate (Figure 2).



**Figure 2: wire loop tray**

### c) Recording of the Neutral Zone Impression:

Bucco-lingual position of the wire loops was checked intra-orally and the free-way space was assessed again. 60:40 mix of impression compound and green stick compound was placed on wire loop and it was placed in the patient's mouth. The patient was then told to perform various oral movements of his lips, tongue and the cheek. These movements included sucking, swallowing, pursing lips, pronouncing E and O sounds and protruding the tongue to simulate physiological movements. While the patient was performing these movements, the occlusal rims were kept in occlusal contact where possible. The shaping / moulding of the material facilitated the recording of the neutral zone when patient performed various oral movements. During function of the lips, cheeks, and the tongue, the forces exerted on the softened material molded it into the shape of the neutral zone. (Figure 3).



**Figure 3: final impression**

These movements (as explained earlier) were performed for a period of 20 minutes after which the base-plate was removed along with the finished neutral zone impression which was sent to the laboratory following disinfection.

Maxillary teeth were set-up in the laboratory and silicone putty indices of mandibular base-plate (Figure 4). The wire-loops along with the molding material were removed and were replaced with modelling wax using the putty indices and mandibular teeth set-up was carried out. These were then returned chair-side so that trial could be carried out conventionally.



**Figure 4: teeth arranged in neutral zone**

### d) Trial:

Trial of the maxillary and mandibular was performed. Occlusion was checked and retention and stability of the both maxillary and mandibular dentures were assessed and found satisfactory both for the upper and the lower arches. The trial dentures were then returned to the laboratory for processing and finishing as usual.

#### e) Insertion and Follow-up:

The dentures were fitted into the patient's mouth (Figure 5) and the patient was reviewed on a couple of occasions. The patient was pleased and reported satisfaction with her existing prosthesis.



**Figure 5: final insertion**

### DISCUSSION

When mandibular ridge is severely resorbed, gaining retention and stability in a denture becomes a challenge. Positioning of the artificial teeth and connection of the polished surfaces with the surrounding tissues are two major factors that determine success in complete denture therapy. When artificial teeth are arranged within the neutral zone, the prosthetic teeth do not interfere with the normal oral function. This technique typically helps to locate posterior denture teeth in a slight facial position rather than their arrangement over the crest of alveolar ridge<sup>10</sup>.

Provision of a mandibular complete denture is often difficult than a maxillary complete denture and it becomes even more difficult when powerful activity of oral musculature exists. Dental implants are a good alternative treatment option in such scenarios however; they may be contraindicated in patients due to a variety of reasons. There are economic, clinical, and medical contraindications when providing dental implants to a patient. Provision of a denture using neutral zone technique may help in overcoming these difficulties. Firstly, it will be ensured that the oral musculature aids in the retention and stabilization of the denture rather than dislodging the denture during function. The dentures made using the NZ technique will have other advantages such as reduced food entrapment, good esthetics due to facial support and proper positioning of the posterior teeth which will allow for sufficient tongue space. Since the current dentures provided to the patient were constructed in harmony with their surroundings, remarkable improvement in facial appearance, stability and retention during function was noticed as compared to the patient's previous dentures.

Fish<sup>5</sup> introduced the principal of the neutral zone in prosthetic dentistry and directed the profession's attention to the importance of designing the dentures in muscular balance. He recommended that the dentures should be designed in such a way that they are concave from the buccal side to accommodate the check muscle. The advantage of recording the neutral zone impression to stabilize mandibular complete dentures is outlined in various clinical studies<sup>2,3,8,9,11,12,13,14</sup>. These studies suggested that this technique helps in functional contouring of all the external surfaces of a finished denture and thus improved retention and stability in a denture can be achieved. Fahmy and Kharat<sup>11</sup> conducted a study that included two groups of patients, one with conventionally fabricated dentures and the other with dentures that were constructed with the neutral zone technique. Mastication, comfort and speech were compared in both the groups. Most of the patients were satisfied with the dentures made using the neutral zone technique. Ohkubo et.al.,<sup>12</sup> suggested that a suitable denture can be made if arrangement of teeth using neutral zone approach is carried out.

They mentioned that this technique is not only helpful in edentulous patients but also for patients with oral deformities. Gupta & Agarawal<sup>13</sup> stated that the neutral zone concept implies acquired muscle control especially by tongue, lips and cheeks towards stability of a mandibular complete denture and by applying the neutral zone concept, the dislodging muscle force can become a retentive and a stabilization force. Rehmann et. al.,<sup>14</sup> have used an alternative technique for recording of neutral zone impression in which acrylic resin base plate with posterior occlusal rims were used. The base plates were worn by patients for a period of two days and the impressions were recorded. Majority of the patients reported improved denture

stability and satisfaction with their dentures. However their technique cannot be used in routine clinical conditions. Watt et. al.,<sup>15</sup> described an entirely different approach of tooth placement for dentures. They studied the pattern of post-extraction resorption in 100 edentulous subjects and found that the vestige of the lingual gingival margin could be identified on the casts and can be utilized as a reliable guide to the placement of the artificial teeth.

### **CONCLUSION**

The neutral zone technique for denture fabrication has an advantage that it stabilizes the denture with the surrounding soft tissues, instead of being dislodged by them. Retention and stability of dentures are greatly improved, especially in the severely atrophic ridges. When patients cannot undergo an implant overdenture therapy due to medical and dental contraindications, the neutral zone technique provides an alternative, time-saving, and relatively simple way to obtain a favorable result. A disadvantage of this technique involves the laboratory aspect. Increased laboratory time and cost are necessary, and the laboratory technician must be trained to support this clinical procedure. Considering the benefits of this technique, it is recommended that clinicians should incorporate it in their routine prosthodontic management of edentulous patients.

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