

# Oral Health Impact Profile for Edentulous Patients with a Complete Denture Fabricated by Neutral Zone Technique

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## ABSTRACT

Conventional complete denture therapy in a patient with severely resorbed mandibular ridge is often challenging. The neutral zone technique is an alternative approach for the fabrication of lower complete dentures in patients with atrophic mandibular ridge and history of denture instability. This technique aims to construct a denture that is shaped by muscle function and is in harmony with the surrounding oral structures. This case report describes the fabrication of complete dentures using the neutral zone technique in a conventional denture wearer and attempts to compare its effect on the Oral Health Impact Profile (OHIP) of the patient.

**Keywords:** Atrophic ridge; complete denture; neutral zone; quality of life.

## INTRODUCTION

Atrophy of alveolar bone is an inevitable sequela of tooth loss.<sup>1</sup> This often leads to a situation where the ridge is no longer sufficient to provide support for the proper functioning of complete denture. In such cases, neutral zone technique can be considered to improve retention and stability of the mandibular denture.

The purpose of this case report is to present the use of the neutral zone technique for the fabrication of stable mandibular denture in a patient with severely resorbed ridge and to find whether such denture has any effect on the oral health impact profile of the patient.

## CASE REPORT

A 70-years-old completely edentulous otherwise healthy female presented to the Department of Prosthodontics, College of Dental Surgery, B.P. Koirala Institute of Health Sciences, Dharan, Nepal, with the chief complaint of an ill-fitting

and unstable lower denture. The patient had been completely edentulous for the past five years and had worn multiple removable complete dentures since then. Her past history revealed that she had changed her dentures two times in the last one year due to the same complaint. Her past treatment records showed that the complete denture worn by her at that time was fabricated eight months back by conventional technique. Intra-oral examination revealed well-formed U-shaped maxillary edentulous ridge (Figure 1) and severely resorbed atrophic mandibular edentulous ridge (Figure 2). Fabrication of new complete dentures, with mandibular denture using neutral zone technique, was planned for the patient. Primary impressions of both maxillary and mandibular arches were made in

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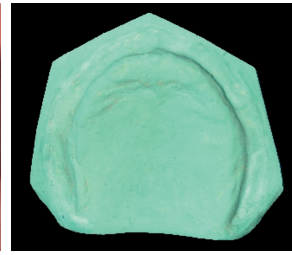
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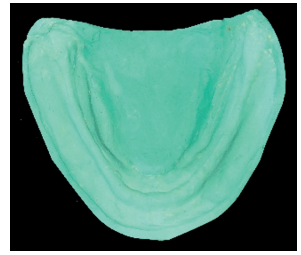
**Figure 1: Maxillary arch.**



**Figure 2: Mandibular arch.**



**Figure 3: Maxillary master cast.**



**Figure 4: Mandibular master cast.**

perforated edentulous stock tray using irreversible hydrocolloid (Zelgan, Dentsply) and poured with type II gypsum product (Kaldent, Kalabhai Karson, India). Custom trays were fabricated with self-polymerizing acrylic resin (RR, Dentsply India) for both upper and lower arches and border molding was performed with low-fusing impression compound sticks (DPI Pinnacle tracing sticks, Dental products of India). This was followed by making final impressions with zinc oxide eugenol (DPI Impression Paste, Dental products of India). The final impressions were poured with type III gypsum product (Kalstone, Kalabhai Karson, India) to prepare the master casts (Figure 3 and 4). Base plates were fabricated on both maxillary and mandibular master casts with self-polymerizing acrylic resin (RR, Dentsply India). Wax occlusal rim was constructed on the maxillary base plate. Acrylic stops were made on the mandibular base plate in the molar region and stainless-steel wire loops were attached in the anterior region of the base plate (Figure 5). Vertical jaw relation was determined using the conventional method. The acrylic pillars were trimmed to adjust the vertical dimension of occlusion.

Neutral zone impression was made by kneading seven parts low-fusing impression compound sticks (DPI Pinnacle tracing sticks, Dental products of

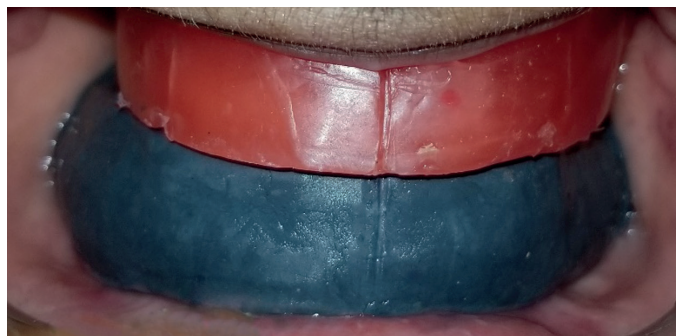
India) and three parts impression compound cakes (DPI Pinnacle functional impression compound, Dental products of India) together.<sup>2</sup> This kneaded compound was adapted over the mandibular base plate to form a recording rim.

The mandibular base plate along with the kneaded compound over it was placed in hot water bath to soften the compound and then placed in the patient's mouth. The patient was asked to perform various functional movements like swallowing, sucking, smiling, protruding the tongue, and licking the lips. The mandibular compound rim was taken out and inspected. The excess compound was trimmed till the level of the acrylic stops. Then the material was re-softened and replaced in the patient's mouth and the functional movements were repeated. This procedure was repeated till a narrow neutral zone was recorded (Figure 6).

Both the maxillary occlusal rim and the mandibular neutral zone record were articulated on a three-point articulator. Addition silicone putty (President, Coltene) was used to obtain an index of the neutral zone record. (Figure 7). The neutral zone record rim, the retentive loops, and the acrylic stops were removed from the base plate (Figure 8). The index was poured with molten modelling wax to obtain a wax occlusal rim which represented the neutral



**Figure 5: Mandibular base plate with acrylic pillars and wire loops.**



**Figure 6: Maxillary occlusal rim with mandibular neutral zone record rim.**



**Figure 7: Addition silicone index of neutral zone record.**



**Figure 8: Index after removal of neutral zone record, wire loops, and acrylic**



**Figure 9: Index poured with melted modelling wax.**



**Figure 10: Teeth arranged in neutral zone.**



**Figure 11: Final denture insertion.**

zone recorded earlier (Figure 9). Teeth arrangement was done on both the occlusal wax rims. Mandibular teeth arrangement was done strictly following the index (Figure 10). The waxed-up dentures were tried-in and aesthetics, phonetics, and occlusion were evaluated. Finally, laboratory procedures were carried out in usual manner to process and finish the dentures. The dentures were inserted and evaluated for aesthetics, stability, and occlusion (Figure 11).

Oral Health Impact Profile in Edentulous Adults (OHIP-EDENT) scores were recorded in the first visit of the patient for the conventional complete denture that she had been wearing for eight months. The scores were recorded again, after four weeks of wearing the new dentures fabricated by neutral zone technique.

## DISCUSSION

The neutral zone is defined as the potential space between the lips and 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.<sup>3</sup> Wilfred Fish first described this zone as ‘dead space’ in 1931 which later came to be known as the neutral zone. The stability of complete dentures is influenced by the surrounding neuromuscular system in the oral cavity.<sup>4</sup> Position of denture teeth and the contours of polished surface play a crucial role in denture’s stability as

they are subjected to destabilizing forces from the tongue, lips, and cheeks.<sup>4</sup> The aim of the neutral zone technique is to construct a denture in muscle balance through physiologically optimal denture contours and physiologically appropriate denture tooth arrangement.<sup>5</sup> Denture fabricated over a severely resorbed mandibular ridge by neutral zone impression technique will ensure that the muscular forces aid in retention and stabilisation of the denture rather than dislodging the denture during function.<sup>6</sup>

Various materials have been recommended for recording neutral zone like modelling plastic, impression compound, polyvinylsiloxane, tissue conditioner, and polyether.<sup>7</sup> In this case, we used a mixture of low-fusing compound and impression compound in the ratio of 7:3. This mixture of compounds, which are readily available, results in a low viscosity material which has better flow and provides an accurate impression.<sup>2</sup> The neutral zone was recorded with the maxillary occlusal rim present in the upper jaw as this supports the facial muscles and allows the tongue to be positioned on the palatal contour during phonetics.<sup>8</sup> However, some authors<sup>4,5</sup> recommend recording the neutral zone without inserting the upper occlusal rim stating that it might exert compressive interference during functional movement like swallowing particularly in patients with diminished vertical height.

**Table 1: Comparison of OHIP-EDENT-N scores for both dentures.**

Domains	Conventional complete denture	Denture fabricated by neutral zone technique
Functional limitation	7	5
Physical pain	4	2
Psychological discomfort	4	4
Physical disability	6	5
Psychological disability	4	4
Social disability	-	-
Handicap	-	-
Total Score	25	20

A Nepali version of OHIP-EDENT (OHIP-EDENT-N), translated and validated by Shrestha et al<sup>9</sup>, was used to compare the impact of the conventional complete denture which the patient had been wearing for past eight months and the new complete denture fabricated by neutral zone technique after wearing for four weeks on the quality of life of the patient. OHIP-EDENT-N consists of 19 questions with seven subscales viz. functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. The questionnaire gives a choice of five answers (4 = very often; 3 = often; 2 = fairly often; 1 = seldom; 0 = never).<sup>9</sup> The total score ranges from 0 to 76. The lower the score, the higher the oral health related quality of life. The OHIP-EDENT-N scores for the conventional complete denture which the patient had been wearing for past eight months were 25 and the scores for the new complete denture fabricated by neutral zone technique after wearing for four weeks were 20 (Table 1).

Significant improvements were found under the “functional limitation” and “physical pain” domains. These improvements may imply that complete dentures fabricated by neutral zone technique have better fit, are more comfortable, and patient have relatively fewer chewing problems with such dentures. In their study, Barrenas and Odman<sup>10</sup> also found that dentures fabricated by neutral zone technique had less post-insertion problems and better patient acceptance when compared with conventional ones.

Hence, the neutral zone technique can be an important alternative approach in patients presenting with unstable lower denture due to severely resorbed ridge, particularly when implant therapy is not feasible due to financial constrain or systemic medical condition of the patient.

**Conflict of interest:** None.



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