

## CASE REPORT

# Neutral Zone: A Novel Technique for Management of Severely Resorbed Ridge

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## ABSTRACT

The average life expectancy of the population has increased, with advances in all the branches of medicine. Thus, a greater number of geriatric patients seek dental services. But due to various conditions they end up in edentulism for longer duration in later stages, which leads to problems related to loose-fitting dentures. As retention of the denture is compromised due to poor denture base foundation, the role of stability becomes even more important, which is achieved by neutral zone. The complete denture must not only fit the edentulous ridge, but its concave mechanical surfaces should fit against the tongue, cheeks, and lips. This case report presents management of Atwood's class V and VI resorbed ridge with neutral zone and management of flabby ridge with window technique.

**Keywords:** Dead space, McCord and Tyson technique, Neutral zone, Potential denture space, Window technique, Zone of equilibrium, Zone of minimal conflict.

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## INTRODUCTION

The average life expectancy of the population has increased, with advances in all the branches of medicine. Thus, a greater number of geriatric patients seek dental services. But due to various conditions they end up in edentulism for longer duration in later stages, which leads to problems related to loose-fitting dentures. Challenges to manage these patients are loss of bone both quantity and quality, age changes, such as mucosa, salivary gland, and patient psychology. Management can be done by implant-supported prosthesis, such as overdentures and fixed prosthesis or surgical modifications, such as sulcus deepening or ridge augmentations.

Retentive aids, such as denture adhesive and suction devices may also be useful.

As retention of the denture is compromised due to poor denture base foundation, the role of stability becomes even more important, which is achieved by neutral zone. Neutral zone is the potential space between lips and cheeks on one side and tongue on the other side.<sup>1</sup> It is also known as dead space,<sup>2</sup> zone of minimal conflict,<sup>3</sup> zone of equilibrium,<sup>4</sup> and potential denture space.<sup>5</sup> Teeth erupt in oral cavity under the influence of muscular environment. This environment, which is created by the forces between the tongue, cheeks, and lips, exerts a definite influence on the position of the erupting teeth, arch form, and occlusion.

## INDICATIONS

- Severely atrophic mandibular ridge (Atwood's class V and VI resorption)
- Prominent and highly attached mentalis muscle
- Lateral spreading of tongue as a result of poor transition from dentulous to edentulous state<sup>6</sup>
- Patients with atypical shape or consistency of oral and perioral structures, e.g., marginal or segmental mandibulectomy and partial glossectomy<sup>7</sup>
- A surgical stent fabricated in Neutral zone helps placement of implants in optimal position for implant-supported overdentures, which enhances the overall outcome of treatment<sup>8</sup>
- Patients with poor neuromuscular control, such as history of stroke, Parkinson's disease, and impaired motor innervation to oral and facial muscles as a result of brain surgery<sup>9</sup>

## CASE REPORT

A 78-year-old (Fig. 1) male patient reported to the Department of Prosthodontics and Crown and Bridge with a chief complaint of loose-fitting lower denture. History revealed the patient wearing complete denture for the past 21 years. Medical history was not relevant. Patient had history of tobacco chewing since 35 to 40 years six to eight times in a day. Intraoral examination revealed Atwood<sup>10</sup> class V resorbed mandibular arch in anterior region and class VI resorption in posterior region (Fig. 2) and Atwood class III resorbed maxillary arch with flabby tissue at 23 region (Fig. 3).

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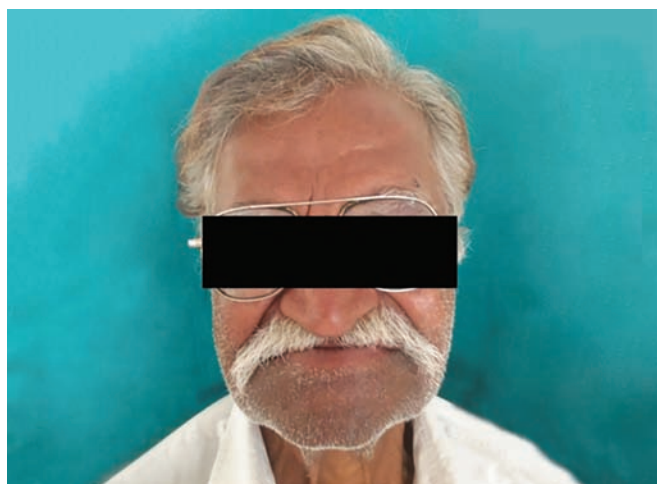


Fig. 1: Old denture frontal view



Fig. 2: Intraoral view



Fig. 3: Intraoral view

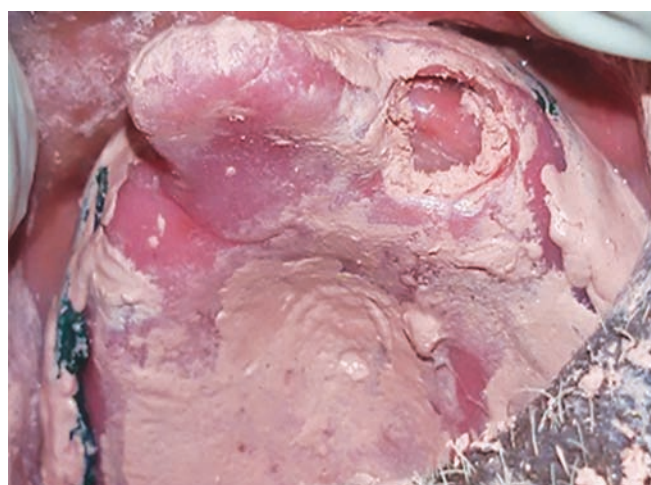


Fig. 4: Maxillary final impression window technique

## Treatment Plan

### Preprosthetic Phase

- Stoppage of use of current denture
- Patient counseling regarding stoppage of tobacco habit

### Prosthetic phase

Described in Table 1.

**Table 1:** Prosthetic phase

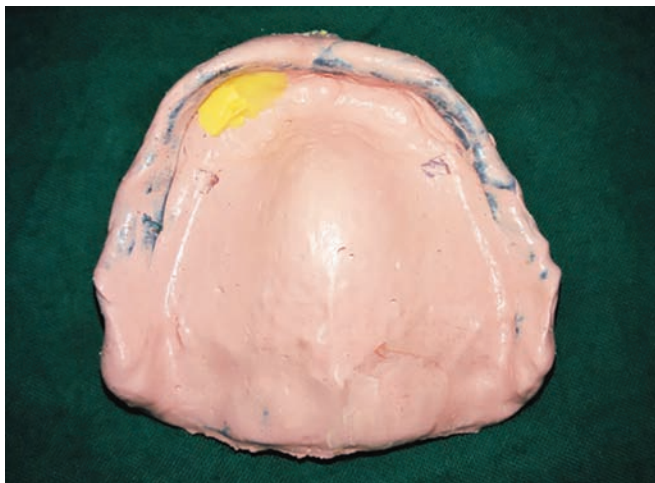
Procedure	Technique/method
Primary impression	Mucocompressive technique
Secondary impression	
a. Maxillary	a. Window technique <sup>11</sup>
b. Mandibular	b. McCord and Tyson technique <sup>12</sup>
Jaw relation	
a. Orientation	a. Face bow
b. Vertical	b. Niswonger–Thompson <sup>13</sup>
c. Centric	c. Gothic arch tracing
Recording neutral zone	Swallowing and phonetics
Occlusal scheme	Bilateral balanced occlusion

### Maintenance Phase

- Patient motivation regarding cessation of tobacco habit
- Periodic follow-ups

### Procedure

After informed consent, detailed case history, and treatment planning, primary impression for maxillary arch was made with irreversible hydrocolloid (neocolloid, Zermac) and mandibular arch was made with high-fusing impression compound (HIFLEX red wax impression compound). Maxillary border molding done with low-fusing impression compound (HIFLEX—green tracing stick impression compound) and final impression was made with zinc oxide eugenol paste (DPI impression paste) and displaceable tissue irreversible hydrocolloid with window technique (Figs 4 and 5).<sup>11</sup> Mandibular final impression was made with admixed impression material by McCord and Tyson technique<sup>12</sup> (Figs 6 and 7). After beading and boxing, impressions were poured with



**Fig. 5:** Maxillary final impression



**Fig. 6:** Mandibular impression with admixed technique



**Fig. 7:** Mandibular final impression



**Fig. 8:** Neutral zone record

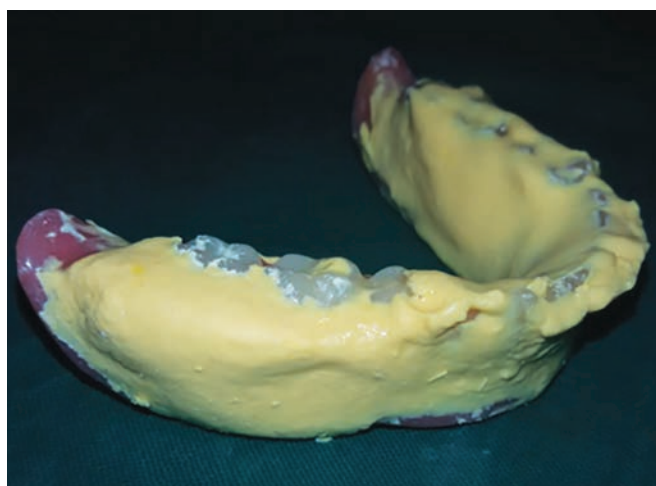
type III gypsum product dental stone. Temporary record base was fabricated with autopolymerizing acrylic resin (DPI RR Cold Cure) with 19 gauge stainless steel wire incorporated in it. Recording of neutral zone was done by swallowing method by asking patient to perform pursing, smiling, opening the mouth wide, wetting the lips, whistling, and speaking ("Sis and SO") 10 times each with admixed impression material loaded on temporary denture base (Fig. 8). Height of neutral zone record was determined by referring anatomic landmarks, such as height of lower lip.<sup>14</sup> It was adjusted on previously recorded jaw relation on articulator and plaster index was made around the recorded neutral zone. Teeth arrangement was done keeping plaster index as guide (Fig. 9). Try-in of trial denture was done, which confirmed arrangement of teeth within neutral zone (Fig. 10), esthetics, phonetics, and occlusion. Flasking, dewaxing, packing, acrylization, finishing, and polishing were performed in the conventional manner. Denture insertion was done after corrections of overextending borders and occlusal corrections (Figs 11 and 12).

## DISCUSSION

Wilfred Fish<sup>2</sup> was the first to put forth his theory concerning the effective contouring of the polished surface of complete dentures. He explained that the complete denture must not only fit the edentulous ridge, but its concave mechanical surfaces should fit against the tongue, cheeks, and lips. Lammie<sup>15</sup> discussed the effect of ridge resorption on the position of the neutral zone. He said that as the ridge resorbs, its crest falls below the origin of the mentalis muscle. This causes the muscle attachment to rest on the superior surface of the ridge. This will result in backward movement and some reduction of the neutral zone in the anterior part of the mouth. Beresin and Schiessir<sup>16</sup> discussed the importance of the neutral zone and gave a method in which the form of the polished surfaces of the dentures is developed at the try-in procedure and this form is replicated into the finished dentures. Mohammad Khamis et al<sup>17</sup> discussed that the width of the neutral zone is minimal at the occlusal plane and gradually increases as it goes up or down. The magnitude of the forces is minimum in the posterior



**Figs 9A to D:** Teeth arrangement within neutral zone



**Fig. 10:** Neutral zone record to confirm position of teeth



**Fig. 11:** Post denture insertion

region and gradually increases toward the anterior. There is no significant difference in the width of the neutral zone in patients with prominent or flat ridges.

A number of techniques relying on oral function to develop the shape of the neutral zone have been described. The technique as detailed by Beresin and Schiesser<sup>16</sup> located the neutral zone using swallowing

as the principal modeling force. Patients were asked to pronounce the phoneme "SIS" five times, followed by the phoneme "SO" once. The softened admixed impression compound material was adapted to the specially designed record bases and formed into the shape of an occlusion rim. The record bases were carefully placed in the subject's mouth without distorting the rim. The subject was



**Fig. 12:** Post denture insertion frontal view

instructed to swallow and then purse the lips as in sucking several times to define the neutral zone.

Different thoughts are mentioned in literature for the faciolingual positioning of artificial teeth. Weinberg stated that buccal cusps and fosse of the posterior teeth should be directly over the crest of the ridge. This position was said to result in more stability and less lateral force since the occlusal pressure on the tooth fell close to the fulcrum and created little or no torque. Hertwell and Rahn indicated that the posterior teeth should be positioned buccolingually on the residual alveolar ridge. Pound stated that invariably arranging the teeth over the crest of the residual ridge condemned patients to accentuated facial deformity, phonetic problems, difficult food manipulation, and instability of the mandibular denture. Murray<sup>18</sup> was of the opinion that artificial teeth should be positioned where the natural teeth grew. Wright et al<sup>19</sup> indicated that the mandibular denture received more tongue pressure in the event of an increase in tongue size. Lammie<sup>15</sup> argued that in aging patients, mandibular posterior denture teeth should be arranged over the buccal shelf to provide increased tongue space and to facilitate the development of vertical facial denture polished surfaces against which an effective facial seal may be achieved and maintained. Tewary et al<sup>20,21</sup> stated that esthetic is improved by using neutral zone technique. Artificial teeth arranged within the neutral zone achieve two important objectives: (1) Prosthetic teeth do not interfere with normal muscle function and (2) normal oral and perioral muscle activity imparts force against the complete dentures that serves to stabilize and retain the prostheses rather than cause denture displacement.

Standard mucocompressive impression techniques are likely to result in an unretentive and unstable denture as the denture is constructed on a model of the flabby tissue in a distorted state. The use of selective pressure or

minimally displacive impression techniques should help to overcome some of these limitations. Window technique<sup>13</sup> is useful for recording flabby tissue with minimal pressure and which prevents rebound of denture and hence, stability of maxillary denture was increased.

Mandibular final impression was made with McCord and Tyson technique.<sup>12</sup> The impression medium here is an admix of three parts by weight of (red) impression compound to seven parts. By weight of greenstick, the admix is created by placing the constituents into hot water and kneading with gloved fingers. The philosophy is that a viscous admix of impression compound flows uniformly and records maximum area which enhances stability of the denture also removes any soft tissue folds and smoothes them over the mandibular bone; this reduces the potential for discomfort arising from the "atrophic sandwich," i.e., the creased mucosa lying between the denture base and the mandibular bone. However, periodic relining and rebasing and fabrication of new denture after 4 to 5 years to minimize further bone loss is advised.<sup>19</sup>

## CONCLUSION

The article presents the clinical significance of use of various techniques to manage resorbed and flabby ridge using various techniques: McCord and Tyson technique for resorbed ridge, windows technique for flabby ridge, and neutral zone for artificial teeth positioning and contouring of complete denture polished surfaces. It requires more clinical and laboratory procedures but enhances patient satisfaction and comfort significantly.

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