

## Neutral Zone Impression Technique in Atrophic Mandibular Ridge using a Modified Design of Lower Base Plate

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### Abstract

Neutral zone is the boundary of cheek, tongue and lips. A neutral zone impression technique is a non-surgical approach for lower complete denture with atrophic mandible. It is considered one of the effective management for unstable and unretentive lower complete denture. In this case report, the construction of complete dentures with this technique for a patient has been explained sequentially. The patient had a severely atrophic mandible. An update of the materials and the technique for the modified lower base plate will be explained for the neutral zone impression, to provide better understanding among dental practitioners. During the review stage, the patient was satisfied with the dentures.

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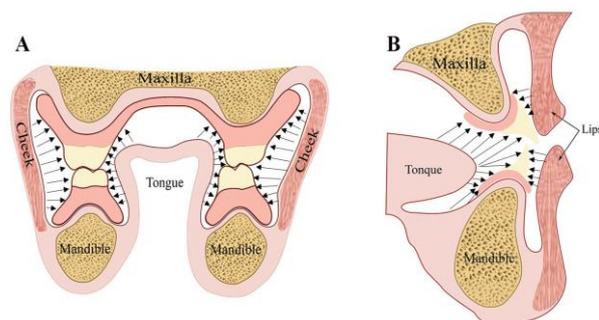
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### Introduction

Severe bone resorption after tooth loss may cause complex complete denture cases with reduced retention, chewing ability and pain<sup>1,2</sup>. Despite dental implants offering better outcome, patients may refuse invasive surgery. Therefore, complete dentures using neutral zone impression technique may enhance patient satisfaction. Neutral zone is 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 (Figure 1)<sup>3</sup>.

The dentures constructed in this muscle balance is kept in harmony with the muscular system, ensuring denture stability, hence improved retention<sup>4</sup>. Neutral zone technique is indicated in patients with severe atrophic mandibular ridge class V resorption<sup>5</sup> and poor neuromuscular control<sup>6</sup>. To record a neutral zone, a lower base plate must be constructed to

support the material and allow good moulding to the tissues. Therefore, this paper aimed to demonstrate all clinical and laboratory stages in the fabrication of complete dentures using neutral zone impression technique with a modified design of a lower base plate, in a patient with a severely resorbed mandibular ridge.



**Figure 1.** Representation of the neutral zone, the forces from the cheek, lips and tongue (arrows). For optimum stability, the dentures should be situated in this zone where the net forces are zero.

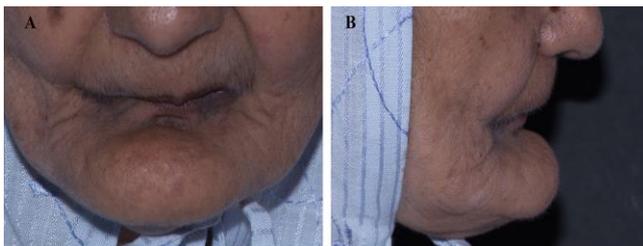
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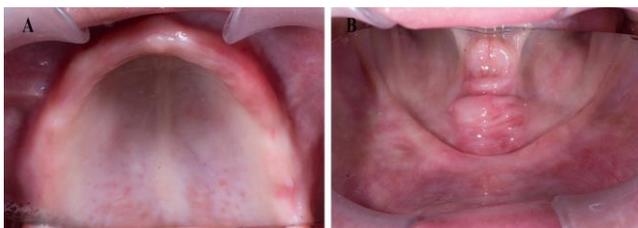
#### Case History:

A 75-year-old female patient presented complaining of loose complete dentures. She has been edentulous for the past 20 years and has

reduced lower facial height (Figure 2). The clinical examination revealed severely resorbed residual ridges and epulis fissuratum in the lingual sulcus and floor of the mouth (Figure 3) with poor denture retention and stability. The patient refused invasive surgery, hence fabrication of a new set of complete dentures using the neutral zone impression technique was the best option for her. The epulis fissuratum was left *in-situ*.



**Figure 2.** Extraoral photographs of the patient prior to the treatment. (A) Frontal view (B) Sagittal view (note the amount of reduced lower facial height).



**Figure 3.** Intraoral occlusal photographs. (A) Upper ridge. (B) Lower ridge (note epulis fissuratum lingual to the ridge).

### Primary and secondary impressions

Primary impressions were made with alginate (Kromopan, Lascod, Italy) using stock trays and poured in Type 3 dental stone (Saint-Gobain Formula GmbH, Germany). Special trays were constructed using a self-cure acrylic (Trayplast, Vertex, Netherlands). Border moulding was done by low fusing green impression compound (Kemdent, UK), the final impressions made with zinc oxide eugenol (SS White, UK). The impressions were poured in Type 3 dental stone, followed by construction of a self-cure acrylic base and wax rims.

### Maxillo-Mandibular relationship record

The horizontal and vertical components of the maxillo-mandibular relationship were established with 2mm freeway space. The centric

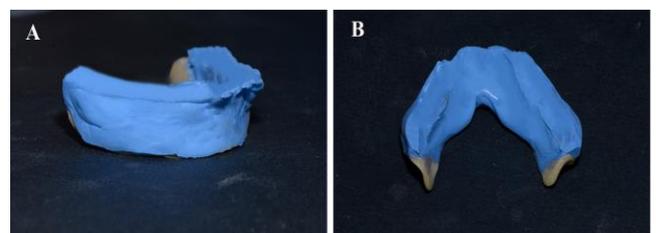
relation was recorded using polyvinyl siloxane (PVS) (EXABITE™ II NDS, GC, Japan) followed by a facebow transfer record. The casts were then mounted on a semi-adjustable articulator using Type 1 plaster (MAARC, Malaysia). A new lower base plate was constructed with two pillars placed in premolar and 0.5 mm stainless steel wire loop in between (Figures 4).



**Figure 4.** The lower base plate with 2 pillars and wire loop in between.

### Neutral zone impression

The upper occlusal rim and lower base plate were inserted, occlusal vertical dimension (OVD) reestablished, and supported by the pillars. The lower base plate was removed, and adhesive (EXAFLEX, GC, Japan) was applied onto the superstructure of the lower base and then reinserted. A medium body PVS (EXAMIX NDS, GC, Japan) was injected onto the superstructure. The patient was then instructed to count from 60-70, smile, lick her lips, grin and purse the lips, and finally swallow using a small sip of water. These actions were repeated until the material was set, then the impression removed and inspected, disinfected and sent to the lab (Figure 5).



**Figure 5.** The neutral zone impressions using medium body PVS.

The shade and size were selected. In the laboratory, two marking grooves were made in the plaster lingually and five markings buccally.

Two separate silicon putty indexes were made around the impression and model. The neutral zone impression, wire loop and the pillars were removed from the base plate. The labial-buccal and lingual indexes were positioned, and a melting modelling wax poured in between them. Then acrylic teeth Dentacryl HXL (Metrodent, U.K) were set on the lower base plate in the neutral zone, followed by upper setting in balanced occlusion.

### Trial dentures

Once the patient was satisfied with the trial dentures, a post-dam area was marked, carved on the cast. In the laboratory, after the final wax-up, denture processing was done using heat-cured acrylic Interacryl Hot (Interdent, Slovenia) in a hot water-bath set at 70 °C for 3 hours, and then at 100 °C for 5 hours. Once deflasked, the dentures were remounted on the articulator and selective grinding was done before finishing and polishing.

### Insertion and review of dentures

The dentures were inserted, and assessed (Figure 6), followed by post-insertion instructions. During the review visits, the patient was satisfied with her prostheses.



**Figure 6.** Extraoral photographs after denture insertion. (A) Frontal view at rest. (B) Frontal view at smile. (C) Sagittal view at rest.

### Discussion

In this case, severe mandibular ridge resorption caused shallow sulci, while her lips, mentalis muscle, and orbicularis oris tended to push dentures backwards. Fabrication of new dentures using the neutral zone technique may enhance the denture stability and reduce discomfort<sup>7</sup>. Stability is considered as the most significant attribute in providing comfort to patients; if not achieved, then both retention and support will be adversely affected<sup>8</sup>.

A variety of materials can be used to record the neutral zone such as tissue

conditioners<sup>9</sup>, PVS<sup>10</sup>, polyether<sup>11</sup>, chairside relining materials<sup>12</sup>, and waxes. In this case, PVS was used due to the unavailability of tissue conditioner. Tissue conditioners offer more working time and less messy compared to PVS and polyether, as well as more accurate than waxes. The choice of material is based on availability and preference.

Lower base plate can be fabricated from heat, self-cure, light-cure acrylic. Designs for the superstructure of the lower base plate include pillars in the premolar region using acrylic and green stick compound or wire-loop extended along the whole base plate, or an acrylic vertical fin extended along the lower base plate (Figure 7). In this case, a combination of pillars and wire-loop were used. The pillars helped in maintaining the OVD during the neutral zone impression making.



**Figure 7.** Different designs of lower base plate for neutral zone impression.

Patient satisfaction with complete dentures fabricated using the neutral zone has been reported to be higher compared to the conventional complete dentures in terms of comfort, speech, retention, stability, masticatory ability<sup>7,13,14</sup>. However, in regards to oral health-related quality of life (OHRQoL), Rehmann<sup>7</sup> found that OHRQoL in complete dentures fabricated using the neutral zone is higher compared to the conventional complete dentures while Geerts<sup>14</sup> found no difference in OHRQoL between both treatments.

### Conclusions

The modified design of the lower base plate for neutral zone impression technique may

be used to manage patients with severe atrophic mandibular ridge and unstable mandibular denture.

### Clinical relevance

Neutral zone impression technique is considered a conservative and useful approach in the management of unstable mandibular denture in atrophic ridge when impossibility of dental implants due to patient's factors.

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### Declaration of Interest

The authors report no conflict of interest.

### References

1. Yamaga E, Sato Y, Minakuchi S. A structural equation model relating oral condition, denture quality, chewing ability, satisfaction, and oral health-related quality of life in complete denture wearers. *Journal of dentistry*. 2013; 41(8): 710-7.
2. Marchini L. Patients' satisfaction with complete dentures: an update. *Brazilian Dental Science*. 2014; 17(4): 5-16.
3. The Glossary of Prosthodontic Terms: Ninth Edition. *The Journal of prosthetic dentistry*. 2017; 117(5s): e1-e105.
4. Fish E. Analysis of stabilizing force in full denture construction. *Brit Dent J*. 1931; 52: 559-70.
5. Atwood DA. Reduction of residual ridges: A major oral disease entity. *Journal of Prosthetic Dentistry*. 1971; 26(3): 266-79.
6. Sadighpour L, Geramipناه F, Falahi S, Memarian M. Using neutral zone concept in prosthodontic treatment of a patient with brain surgery: a clinical report. *Journal of prosthodontic research*. 2011; 55(2): 117-20.
7. Rehmann P, Künkel AK, Weber D, Lotzmann U, Woestmann B. Using a modified neutral zone technique to improve the stability of mandibular complete dentures: a prospective clinical study. *Int J Prosthodont*. 2016; 29(6): 570-2.
8. Jacobson TE, Krol AJ. A contemporary review of the factors involved in complete denture retention, stability, and support. Part I: Retention. *Journal of Prosthetic Dentistry*. 1983; 49(1): 5-15.
9. Lynch CD, Allen PF. Overcoming the unstable mandibular complete denture: the neutral zone impression technique. *Dental update*. 2006; 33(1): 21-2, 4-6.
10. Butt K, Leyssen W, Attrill D. Technique tips: The modified manchester bite block. *Dental update*. 2018; 45(8): 783-5.
11. Halim MS, Ariff TFTM. Partial Mandibulectomy Rehabilitation of Keratocystic Odontogenic Tumour Case in Neutral Zone. *Case Reports in Dentistry*. 2018; 2018: 8918673.
12. McCord JF, Grant AA. Impression making. *British Dental Journal*. 2000; 188: 484-492.
13. Al-Magaleh WaR, Swelem AA, Abdelnabi MH, Mofadhal A. Effect on patient satisfaction of mandibular denture tooth arrangement in the neutral zone. *Journal of Prosthetic Dentistry*. 2019; 121(3): 440-6.
14. Geerts G. Neutral zone or conventional mandibular complete dentures: a randomised crossover trial comparing oral health-related quality of life. *Journal of oral rehabilitation*. 2017; 44(9): 702-8.