

Prosthetic management of severely resorbed mandibular ridge using neutral zone technique in complete dentures: a case report

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Abstract

Any prosthodontic procedure aims to restore a patient's function, contours, aesthetics, speech, and health to normal. In traditional complete dentures, achieving optimal denture stability is always found to be a challenge. This is often exacerbated in resorbed mandibular ridges. Therefore, this article describes a strategy for enhancing the retention of mandibular complete dentures for individuals with an extremely resorbed ridge. A patient reported to the department of prosthodontics with a chief complaint of loose dentures and wanted to get them replaced. A complete clinical examination was carried out which revealed severely resorbed mandibular ridge. After a complete evaluation, prosthetic rehabilitation with a complete denture using the neutral zone technique was planned. The complete denture was made and delivered to the patient was superior in terms of stability, function and aesthetics. The clinician should understand the advantages of the neutral zone technique and implement it in clinical practice so that a prosthesis that is functionally, physiologically and psychologically acceptable to the patient can be delivered.

Keywords: Neutral zone, Denture stability, Admix Compound, Resorbed ridges.

1. Introduction

Although implant treatment is becoming more popular and is being proposed as the gold standard, traditional complete denture therapy is still a viable treatment option for the vast majority of the edentulous population with a low socioeconomic status in particular. Aside from the fact that conventional dentures have proven to be an effective treatment for certain patients, this is an option but is denied in certain cases due to a loss of retention, absence of face support, lack of stability and aesthetics, functionally ineffective tongue, gagging, poor mastication and non-adaptive patients. All these variables have traditionally been linked to physiologically inadequate contours or a large denture base volume and a functionally ineffective positioning of the denture. It should be emphasized that a denture should be positioned within a zone of lowest conflict between the buccal and lingual musculature. This low-conflict zone is also known as the neutral zone or denture space. Fish [1] initially outlined the neutral zone (NZ) technique in 1931, thus, it isn't quite new. Since then, it has been investigated and shown to be useful, particularly for edentulous patients who are difficult to treat with traditional dentures and for whom implant placement is not feasible. Unfortunately, owing to the additional chair time, increased laboratory costs, and complexity of the technique, as well as a lack of operator's expertise, this strategy is not frequently or consistently employed. The neutral-zone theory is founded on the idea that within the denture space, there is a precise area where the musculature's activity will not unseat the denture and where forces created by the tongue are neutralised by forces generated by the lips and cheeks for each patient. Tooth position and flange contour

have an equal or higher impact on denture stability than any other element. We shouldn't be dogmatic about teeth being put over the ridge's crest, whether buccal or lingual to the ridge. Teeth should be placed according to the muscle attachments, which will vary depending on the patient. Two goals are achieved by placing artificial teeth in the neutral zone. The teeth will not obstruct normal muscular activity, and the pressures exerted by the musculature on the dentures will be more beneficial for stability and retention. The goal of this paper was to present a way of documenting the neutral zone for mandibular complete dentures using an impression technique. Historically, different terminologies were used to describe this technique, such as dead zone [2], stable zone [3], zone of minimal conflict [4], zone of equilibrium [5], biometric denture space [6], denture space [6], potential denture space [7] and zone of least interference [7].

A neutral zone technique using an impression compound mixed with a green stick compound called as Admix in a 3:7 ratio has been described for the management of a severely resorbed mandibular edentulous ridge.

2. Case Report

A 70-year-old female patient came to the Department of Prosthodontics, with a fully edentulous and badly resorbed mandibular ridge (Figure 1). The mandibular arch was badly resorbed (ACP class IV) with shallow sulcus depth (Figure 2). The maxillary residual ridge contours were satisfactory with not much resorption (Figure 3). The patient had been wearing her old denture for almost 40 years but was unhappy with it because of her diminished

chewing efficiency. The patient reported that an impaired masticatory function and inability to eat harmed her quality of life. On examination of the previous denture, there was a significant loss of vertical dimension of occlusion. The teeth in both maxillary and mandibular denture were severely attrited and the dentures were in a class III relationship. Two treatment options were discussed with the patient. The first was a conservative treatment option of implant-supported overdenture but the patient refused this option because of personal reasons. Also, considering the age of the patient, to avoid surgical intervention, a non-invasive second treatment option of making conventional dentures was opted. Since the mandibular residual ridge was severely resorbed, it was decided to perform a neutral zone impression technique on the mandibular ridge. Patients for whom implant therapy is not an option may benefit from enhanced denture function of their lower complete denture using the technique described. The following include the treatment objectives.

- Prosthodontic rehabilitation of a patient with complete dentures.
- To ensure that the prosthesis is stable, comfortable, and functional as possible.
- To find the neutral zone and position the denture teeth correctly, as well as to contour the polished surfaces of a complete denture.
- To reduce further residual ridge resorption.
- To restore the lost vertical dimension of the patient.



Figure 1: Pre-Treatment (Frontal View)

2.1 Procedure

Preliminary impressions of the maxillary and the mandibular arches were made using a metal stock tray and impression compound. A plaster model was poured from this impression, and an acrylic special tray was fabricated with 2mm spacing. The maxillary and mandibular secondary impressions were made using zinc oxide eugenol impression paste after border moulding with green stick compound (Figure 4 and 5). Then beading and boxing were done, and the impression was poured with type III dental stone. The maxillary denture base was fabricated with shellac and for the mandible, a permanent denture base was fabricated with acrylic resin using the compression

moulding technique. After investing processes, care should be taken to retrieve the mandibular master cast without breaking it.

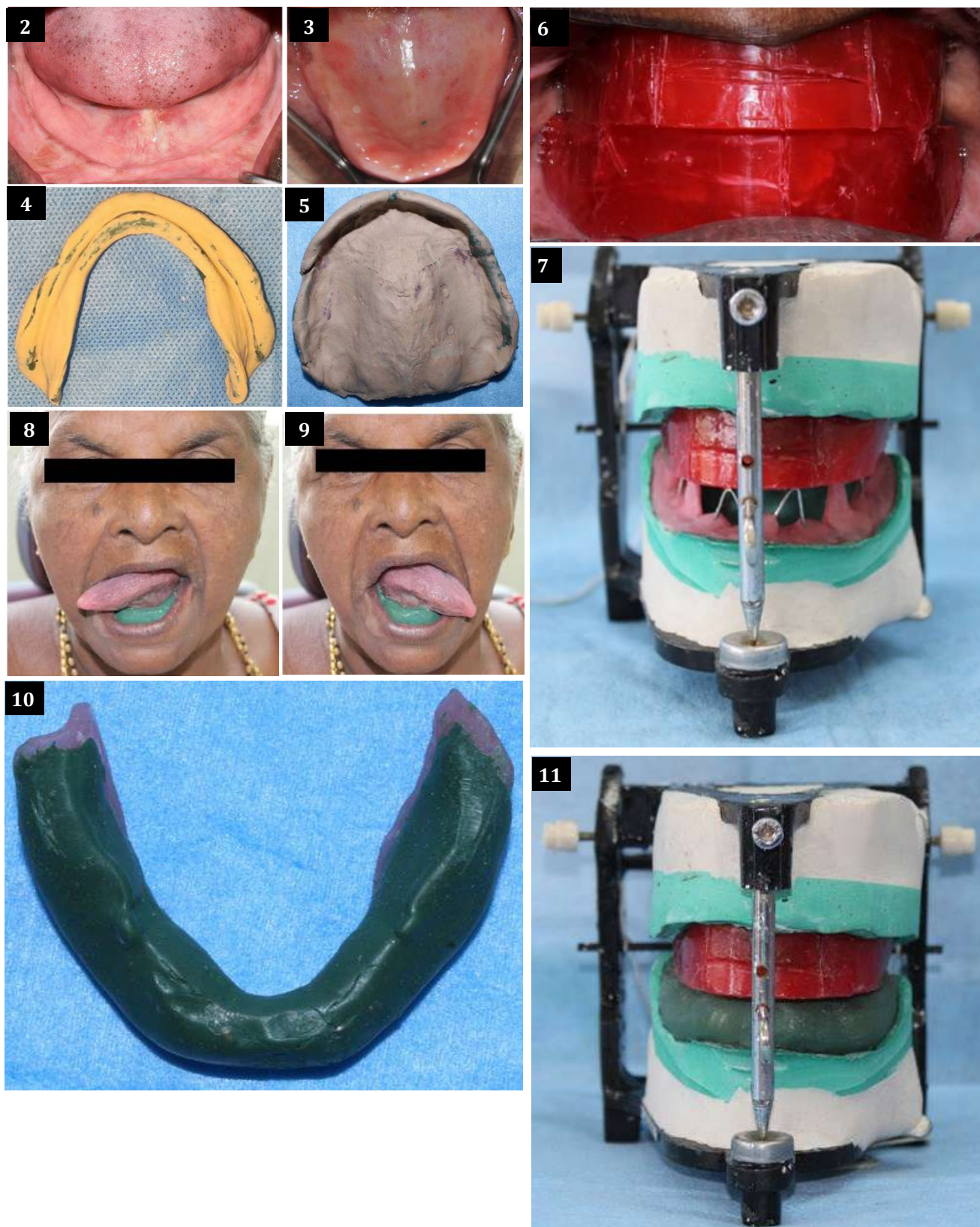
The maxillary and mandibular occlusal rims were fabricated, and the jaw relations of the patient were recorded (Figure 6). After recording, both casts were mounted on a 3-point articulator. The occlusal rim of the mandibular cast was removed, and auto polymerising resin was moulded and placed in the right and left premolar area touching the upper occlusal rim as vertical stops. A 19-gauge wire was bent as spurs or fins and is attached vertically to the permanent denture base using auto polymerising acrylic resin opposing the maxillary rim (Figure 7). This was to keep the admix compound in place while it is moulded in a neutral zone by muscle function.

At the time of appointment, green stick and impression compound were softened in ratio 3:7, moulded and placed over the mandibular permanent denture base attached with spurs and acrylic stops. This was placed in the patient's mouth and instructed her to perform functional movements such as swallowing, smiling, puckering, sucking in lips, puffing of cheeks etc. keeping the acrylic stops in contact with the upper occlusal rim. Then stability of the mandibular rim was checked by performing tongue movements (Figures 8 and 9). Thus, functional movements were registered at the correct occlusal vertical dimensions (Figure 10). The hardened material was removed, and then the denture base with the recorded material was placed back on the articulator to check for any loss of vertical height and there was no change in the existing vertical dimension (Figure 11).

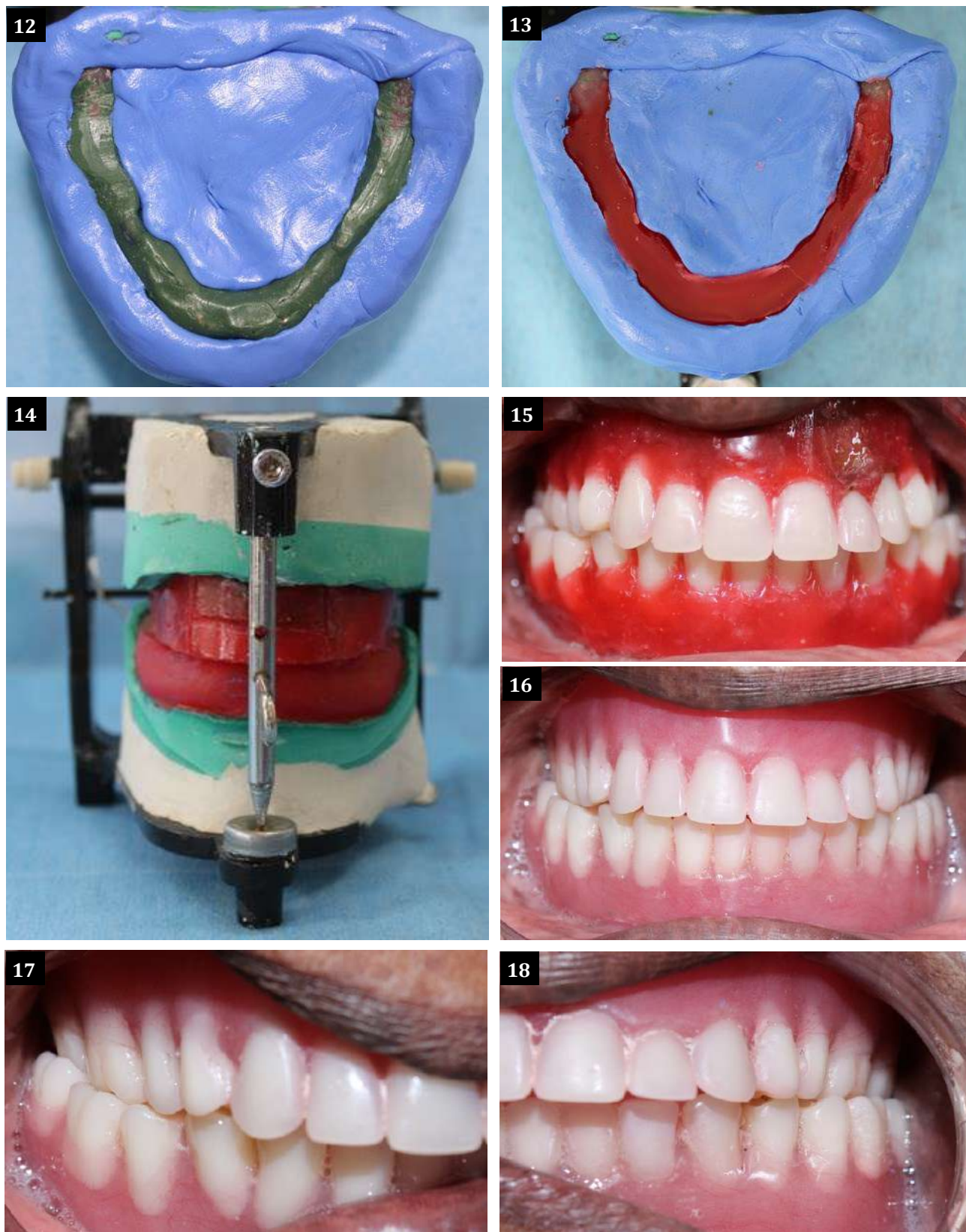
In the laboratory, the denture base with a recorded neutral zone was placed on the master cast and addition silicon impression material (putty) was used to make an index (Figure 12). The material was placed around the mandibular occlusal rim made of admix compound. Once it was set, the admix compound along with spurs and acrylic stops were removed and subsequently substituted with modelling wax (Figures 13 and 14). As the mandibular ridge was wider buccolingually than the maxillary ridge, the teeth were positioned in a Crisscross fashion due to the geometric form of the existing mandibular residual ridge. During the try-in appointment, dentures were evaluated for stability, function, phonetics, and aesthetics (Figure 15). The patient was satisfied with the try-in appointment, and the dentures were returned to the laboratory. The complete denture prosthesis was processed with a conventional technique using polymethyl methacrylate resin. The denture was finished and polished (Figures 16,17, and 18). Denture insertion was done, and post insertion instructions were given. The patient was satisfied with the denture in terms of stability, function, and aesthetics (Figure 19). On clinical assessment, the denture provided the patient with improved facial appearance, stability, and retention during function.

3. Discussion

Every edentulous patient has unique treatment requirements. Proper diagnosis and treatment plan are critical when the clinician has to address prosthetic rehabilitation of severely resorbed ridges.



Figures. 2. Severely resorbed mandibular ridge, 3. Maxillary alveolar ridge, 4. Mandibular secondary impression, 5. Maxillary secondary impression, 6. Jaw relation record, 7. Spurs attached to the mandibular permanent denture base, 8. Right tongue movements with admix material in situ, 9. Right tongue movements with admix material in situ, 10. Recorded neutral zone with admix compound, 11. Record in the articulator to assess vertical dimension.



Figures. 12. Putty index with addition silicone impression material, 13. Admix compound replaced with modelling wax, 14. Maxillary and mandibular occlusal rims on articulator, 15. Crisscross arrangement of posterior teeth, 16. Finished complete denture prosthesis, 17. Right lateral excursion, 18. Left lateral excursion.



Figure 19. Patient with finished denture in situ

A review by Taylor *et al.* noted that the overall failure percentage of conventional complete dentures observed for 5 years was 12% and for 10 years was 41% respectively¹³. The neutral zone philosophy is based on the concept that in every individual there exists a space where the forces generated by the muscles of the tongue are neutralized by the forces generated by the facial muscles and thus the dentures will not get unseated. Several studies comparing complete dentures fabricated by neutral zone observed that neutral zone dentures are functionally more stable than conventional dentures with minimum post insertion problems¹⁴. The neutral zone technique described here is particularly effective for severely resorbed mandibular ridges where denture stability is questionable. The neutral zone approach usually advocates a closed-mouth impression technique. The advantage of this technique is that by utilizing the neutral zone approach, a complete denture prosthesis with improved stability and retention was obtained which we cannot acquire using conventional complete denture fabrication techniques. Also, the quality of life, aesthetics and masticatory efficiency have been improved. The major drawback of the technique is that this is time-consuming and needs clinical expertise. Patient cooperation is also a major factor in determining the success of this approach. In this case, the patient was using the old dentures for almost 40 years, and it was difficult for her to adapt to the new prosthesis with an increased vertical dimension. So, in such cases, a semi anatomic teeth or non-anatomic teeth further enhances the stability and function of the prosthesis.

6. Conclusion

The neutral zone approach has to be given importance while treating patients with severely atrophic mandibular ridges. This technique aimed to fabricate the dentures with a muscular equilibrium where the tongue and cheek muscles act as the main stabilizing and retentive factor during oral functions. The clinician should understand the advantages of this technique and implement it in clinical practice so that a complete denture prosthesis which is functionally, physiologically and psychologically acceptable for the patient can be delivered.

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