

Case Report

Rehabilitation of Severely Atrophic Mandibular Ridge using the Neutral Zone Technique

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Abstract:

Oral functions such as speaking, chewing, swallowing, smiling, and laughing, require a complex combination of the tongue, lips, cheeks, and floor of the mouth. To ensure that these functions work properly, dentures must be designed to complement the natural neuromuscular processes of the mouth. In cases of highly atrophic ridges, the neutral zone technique is an alternative method for creating lower complete dentures. The goal of this technique is to construct a denture that is shaped by muscle function and is in harmony with the surrounding oral structures. This case report outlines a version of the traditional neutral zone technique that utilizes condensation silicone. The technique was used to treat a patient with an atrophic mandibular ridge who was experiencing issues with unstable old dentures.

Keywords: Neutral Zone technique, atrophic ridge, neuromuscular incoordination.

Introduction

Dentists face a challenging scenario with unstable mandibular complete dentures. Residual ridge resorption (RRR) is a chronic, progressive, irreversible, and disabling disease of multifactorial origin. RRR is an inevitable and natural physiologic process.⁽¹⁾ Conventional dentures are unstable and unsatisfactory for patients suffering from RRR. The aim is to record the neutral zone where the teeth should be positioned so that the forces exerted by muscles will tend to stabilize the denture. The neutral zone is where, during functional movements, the inward forces of the lips and cheeks balance out the outward forces of the tongue.⁽²⁾ Various materials such as impression compounds, tissue conditioners, waxes, and impression plaster have been used for recording the neutral zone. Each material has its inherent advantages and disadvantages.⁽³⁾ In this case report, condensation silicone is

used for recording the neutral zone, saving considerable chairside time.

Case Report:

A male patient, 63 years of age, reported to the clinic with unretentive lower dentures. The patient's medical history revealed that he was diabetic and under medication. Diabetes mellitus can produce tenderness of the mucosa, rendering it prone to infections and dryness of the oral mucosa.⁽⁴⁾ On clinical examination, the maxillary residual alveolar ridge was rounded and well-formed, but the mandibular residual ridge was unfavorable due to a high degree of resorption (classified as Atwood's Order V-low and well-rounded) (Fig.1). Based on the clinical findings, complete dentures with neutral zone technique were planned.

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Figure. 1

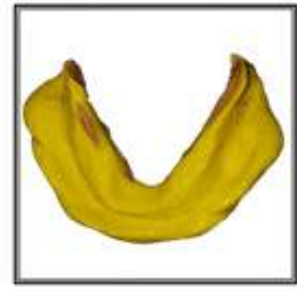


Figure. 2



Figure. 3



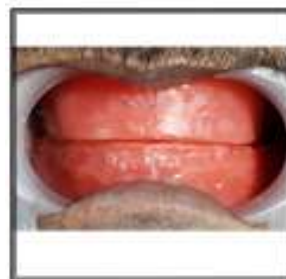
Figure. 4



Figure. 5



Figure. 6



Figures. 7 & 8



Clinical Visit 1:

1. The primary impressions were made using irreversible hydrocolloid material (Zhermack Dust-free Thixotropic Tropicalgin, Zhermack SpA, Badia Polesine [RO], Italy). The material was chosen based on the history of diabetes and its effect on oral tissues. **(Fig.2)** The impressions were disinfected and immediately poured with dental plaster.
2. Custom trays were made for both maxillary and mandibular casts using DPI (Dental Products of India) - RR cold cure acrylic material (Bombay Burmah Trading Corporation, Ltd., Mumbai, India). **(Fig.3)**
3. The maxillary final impressions were made using a green stick and Zoe (DPI - Pinnacle). **(Fig.4)**
4. The mandibular final impressions were made using admix technique. Three parts by weight of impression compound and seven parts by weight of tracing compound (DPI - Pinnacle) was used. **(Fig.5)**

5. Master casts were poured with dental stone (Zhermack Elite Model Stone, Zhermack SpA, Badia Polesine [RO], Italy) after beading and boxing and retrieved after the complete set. **(Fig.6)**

Clinical Visit 2:

1. Maxillary and Mandibular rims were made (Pyrax, Uttarakhand, India).
2. The maxillary occlusal rim was inserted, and parallelism was verified using the Fox occlusal plane. The mandibular record base was also placed in the patient's mouth and checked for extension and stability, and the vertical dimension was determined using Niswonger's Method **(Fig.7)** The centric relation is recorded using the Nick and Notch Method. **(Fig.8)**
3. Facebow record was done using Hanau's Spring Bow and was transferred to Hanau Wide Vue Semi-adjustable articulator (Whip-Mix). **(Fig. 9 & 10)**

- The mandibular rim is removed and replaced by ² vertical stops made via green stick compound held in place with orthodontic wires maintaining the vertical dimension on the articulator. (Fig.11)

Clinical Visit 3:

- Maxillary rim is inserted in the patient's mouth.
- Condensation Silicone (Zhermack ZetaplusC Silicone Intro Kit) is manipulated according to the manufacturer's instructions, placed on the mandibular record base and inserted in the patient's mouth. The patient is instructed to perform routine mandibular movements (including swallowing, sucking of the lips, and pronouncing the vowels), which aid in molding the neutral zone space (Fig.12 & 13). Once the material sets, both the record bases are removed, disinfected, and positioned onto the articulator.
- An index is made surrounding the neutral zone record

using C-silicone attached with cyanoacrylate. The neutral zone record is removed, and the teeth arrangement is done as per the neutral zone. (Fig.14 & 15)

Clinical Visit 4:

A wax try-in is performed to evaluate mandibular record base stability, aesthetics, and intraoral occlusion. The trial dentures are processed with heat-cure acrylic resin, and the denture is polished so that the customized contours remain unaltered. (Fig.16)

Clinical Visit 5:

The denture is inserted and verified for retention, stability, and occlusion. The patient was comfortable with the complete denture prosthesis. (Fig. 17) Periodic recall visits were scheduled to verify the retention, comfort, and function.



Figure.9



Figures. 10



Figure.11



Figures.12 & 13



Figures.14 & 15



Figure.16



Figure.17

Discussion:

Patients with atrophic mandibular ridge often struggle with the use of removable complete dentures, as they can be unstable and negatively impact mastication and speech. The neutral zone technique is a method used to record the area where the forces of the cheeks and the tongue are balanced, allowing for the placement of teeth in a way that provides stability and enhances the patient's quality of life.

In this particular case report, the final mandibular impression was taken using the admix technique to increase stability and retention. The traditional method was used to record the vertical dimension and centric relation, which saved time and reduced the likelihood of error when it came to trimming acrylic stops and recording the centric relation. The vertical stops were made on the articulator, which ensures that the vertical dimension is not altered.

Various materials have been used over the years to record the neutral zone, including impression compound, impression plaster, waxes, tissue conditioners, and polyether.

However, each material has its drawbacks. For example, impression compound has a high viscosity, making it difficult to perform oral functions such as blowing, sucking, and pursing of the lips. Impression plaster is messy and carries the risk of the patient swallowing fragments of plaster while performing functional movements. Tissue conditioners lack sufficient body, making them difficult to use, even when supported by wire loops. The uniform softening of

complete wax rims is critical for recording full functional movements, and if not done correctly, can lead to an inaccurate recording of the neutral zone.⁽⁵⁾

The use of condensation silicone was employed in this case, as it requires less chairside time and is easier to handle. The index was also made using condensation silicone to reduce lab work. However, the downside of this material is that any modification is not possible in the set material, and repetition is required if any modification is needed.

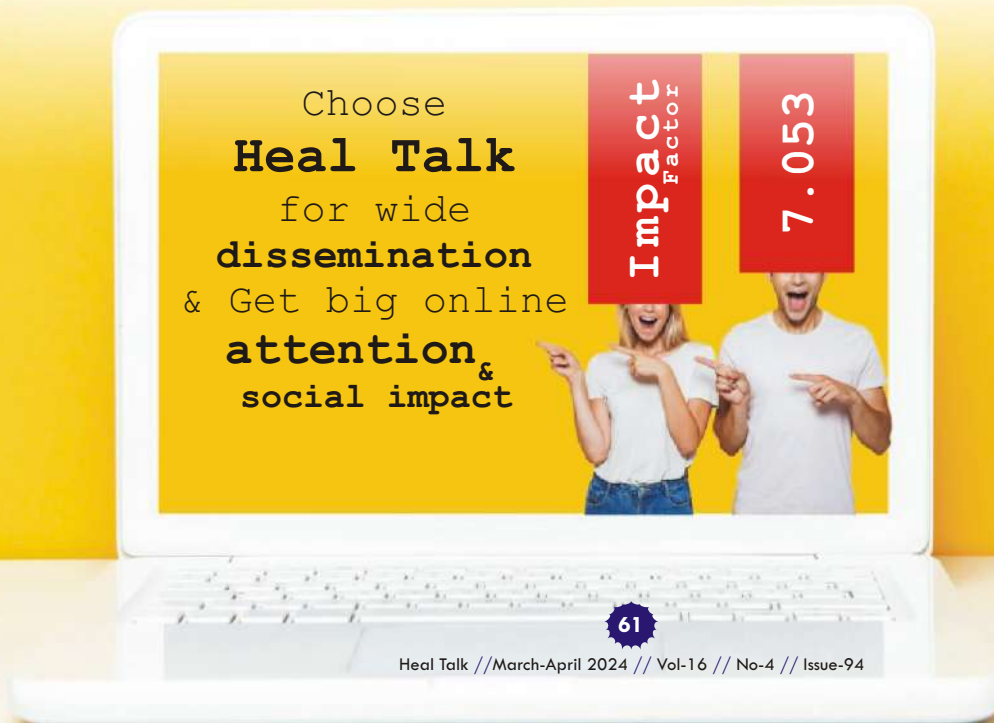
Conclusion:

The process of creating a denture that fits well on atrophic ridges can be quite challenging. To overcome this challenge, dental professionals often employ the neutral zone technique, which involves identifying the area in the mouth where the forces of the tongue and cheeks are balanced and positioning the denture in such a way that it is supported by these forces.

This technique can result in a more comfortable, stable, and functional denture for the patient.

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