

Rehabilitation of severely resorbed mandibular ridge using the neutral zone concept- A case report.

Sreepada Dash¹, Gunjan Srivastava², Subrat Kumar Padhiary³, Monika Samal¹.

¹PGT, Department of Prosthodontics, Institute of Dental Sciences, Siksha 'O' Anusandhan University, Bhubaneswar, India.

²Professor, Department of Prosthodontics, Institute of Dental Sciences, Siksha 'O' Anusandhan University, Bhubaneswar, India.

³Professor, Department of Oral and Maxillofacial Surgery, Institute of Dental Sciences, Siksha 'O' Anusandhan University, Bhubaneswar, India.

Abstract

Complete denture prostheses are mechanical devices that harmonize with the surrounding oral mucosa, tongue, and standard neuromuscular control. In patients with severely compromised mandibular ridges, prosthetic restoration becomes difficult due to severe resorption of the ridges and poor muscular control. The neutral zone concept is applied to have a promising outcome for the mandibular complete denture prosthesis and to obtain adequate basal tissue support. This case report describes the fabrication of a mandibular complete denture prosthesis using neutral zone and salvage the resorbed mandibular ridge.

Keywords: Complete denture, neutral zone, residual ridge resorption, retention, stability.

Address of correspondence: Dr. Gunjan Srivastava, Professor, Department of Prosthodontics, Institute of Dental Sciences, Siksha 'O' Anusandhan University, Bhubaneswar, India – 751003

Email address: - gunjansrivastava@soa.ac.in **Phone no:** 9337201352. **DOI:** 10.5281/zenodo.11050404

Submitted: 08-Feb-2024 **Revised:** 01-Mar-2024 **Accepted:** 22-Mar-2024 **Published:** 26-Apr-2024

Bibliographic details: Journal of Orofacial Rehabilitation Vol. 4(1), Apr 2024, pp. 33-39.

Introduction

Complete denture prosthodontics deals with the restitution of masticatory function, changing the facial appearance, and restoring the mental and physical well-being of the patient. Various oral musculature movements such as deglutition, speech, and mastication occur due to the combined action of the lips, tongue, and cheeks musculature along with the neuromuscular forces. The magnitude of the force applied differs based on the individual patient.^[1,2] The location of the natural tooth is determined by the forces applied by the buccal muscles and the tongue.^[3] Significant changes occur with the loss of the teeth, such as gradual alveolar ridge resorption, facial muscle laxity, collapse in the vertical facial dimension, and difficulty in performing the different masticatory functions.^[4] Knowledge of the neutral zone space is necessary to locate a stable position for an acceptable teeth arrangement.^[5]

The Neutral Zone concept was put forward in 1931 by Sir E. Wilfred Fish.^[6] The Neutral Zone is the area between lips and cheeks buccally and tongue lingually. The opposing forces of the lips, cheeks are nullified by the forces of tongue in this area. Failure to record this zone leads to unstable and poor complete denture prosthesis, which dislodges upon tongue movement or mastication, causing discomfort to the patient.^[1] Thus, this approach helps determine the edentulous space where artificial teeth stabilize the denture against the forces generated by the tongue and buccal musculature. This article uses the neutral zone concept to obtain sufficient retention, stability, and support from the atrophic ridge and enhance masticatory functions in harmony with buccal and tongue musculature.

Case Report:

A 66-year-old male patient came with the five year history of an ill fitting lower mandibular

denture along with difficulty in chewing and speech. On clinical examination, no abnormalities were observed in the temporomandibular joint (TMJ), facial musculature, lips, and cheeks. A fully edentulous maxillary arch and severely resorbed mandibular ridge with no hypermobile soft tissue upon palpation were found during the intraoral examination. (Figure 1 a and b)

The primary objective of the present treatment plan was to fabricate a complete denture by identifying the neutral zone and arranging the artificial teeth according to the located zone, which would deliver optimum stability of the dentures and improved retention.

Treatment Protocol

1. Maxillary and mandibular primary impressions were recorded using an impression compound. (DPI - Pinnacle Impression Compound, Mumbai, India). The primary impressions were poured using the type-2 dental stone, and primary casts were made. (Orthocal, Kalabhai Karson Pvt Ltd, Mumbai, India). The fabrication of custom trays for both arches was done.
2. Border molding was done using green stick compound (DPI – Pinnacle Tracing Sticks, Mumbai, India) for both the arches, after which the final impression was made using the zinc oxide eugenol impression paste. (DPI Impression Paste, Mumbai, India)
3. The record bases were fabricated on the final cast. (Kalstone, Kalabhai Karson Pvt Ltd, Mumbai, India). It was assessed for comfort and stability. Following with the maxillomandibular jaw relations were done and the casts were mounted on a semi-adjustable articulator.
4. The second record base was fabricated using self-cure resin for the mandibular arch. DPI (Dental Products of India) - RR cold cure acrylic material, Mumbai, India). Over this record base, retentive loops made with 27-gauge orthodontic wire were adapted at a

lower occlusal rim height to keep the upper occlusal rim in place. Trimming and finishing of the lower record base were done and evaluated intra-orally to ensure that the retentive loops stayed straight and did not hinder the various buccal muscle and tongue movements. (Figure 2 a and b)

5. Three parts of the impression compound with seven parts of low-fusing green stick compound were mixed and kneaded in a hot water bath at 45 degrees centigrade. (DPI - Pinnacle Impression Compound and Tracing Sticks, Mumbai, India). This material was adapted over the retentive loop and the record base. This record base was put in the patient's mouth, and the upper record base was placed with the occlusal rim. The patient was instructed to make various movements such as swallowing, sucking, puckering of lips, pouting, wide grinning, and production of exaggerated sounds such as O and E, and different tongue movements. Any excess material would be displaced, which can be easily removed. If there is insufficient material, gradual additions of extra impression material can be made, and the process is repeated (Figure 2 c and d).

6. After confirming it in intra-orally, the compound molded rim was put on the articulator to verify the vertical maxillo-mandibular relationship with the maxillary wax occlusal rim.

7. Putty consistency elastomeric impression material is used to obtain the index from the neutral zone record of the lower arch. After this, the compound rim is replaced with a self-cure resin record base on the lower arch. The putty index was rearranged along the labial and lingual part of the mandibular cast with a record base, and molten wax flowed into the space to obtain a lower wax occlusal rim. Thus, according to the recorded neutral zone, we get a lower record base with a wax occlusal rim. (Figure 3 a, b and c)

8. Teeth arrangement was done, using the putty index (Figure 3). Try-in was done. The

patient was requested to make various similar movements, and the occlusion was checked. (Figure 4 a, b and c.)

9. Flasking, dewaxing, and packing the trial denture was done following the try-in procedure. The cured final prosthesis was finished and polished. Maxillary and mandibular complete denture prostheses were given to the patient after verifying the occlusion, retention, and stability. (Figure 5 a, b and c.)

The patient was delighted with the maxillary and mandibular complete denture prostheses as they provided better retention than the previous denture. Masticatory efficiency was also improved. Post-denture insertion instructions were given. Patient was advised for periodic follow-up after seven days, one month, six months, and one year.

Discussion:

The main objective of rehabilitation using any prosthodontic procedure is to restore the functional role of the lost part, maintain the aesthetics, and address the patient's psychological well-being. In edentulous patients, as the teeth are lost, the lips and cheeks tend to collapse inward, giving the patient a shrunken appearance.^[7] However, the tongue musculature, without teeth, becomes broader and stronger and doesn't undergo any atrophy.^[8] This leads to the alteration in the position required by the tooth and its supporting structures, which gradually form the denture space.^[9,10] In this denture space, the neutral zone gets modified depending on ridge resorption and lips collapsing.^[11]

In the fabrication of complete denture prostheses using the conventional method, simple materials and procedures have been followed over the years to achieve optimum results.^[12] However, in a severely atrophic mandibular ridge, certain modifications are required to stabilize the denture and achieve adequate masticatory efficiency, which can be

obtained by harmonizing the denture with the surrounding musculature. The denture fabricated using the neutral zone technique guards the prosthesis against dislodging forces from the cheek muscles or the tongue and enhances masticatory functions.^[9] These dentures present added advantages such as preventing food lodgment, improving aesthetics, providing adequate facial and lip support, and offering sufficient space for the tongue.^[13] Moreover, there is no interference of the artificial teeth in chewing or speech, and forces from the oral and perioral musculature against the denture prosthesis help stabilize and retain the denture, achieving the two most essential objectives of using the neutral zone concept for the resorbed ridge.^[14,15] In the present case report, the neutral zone recorded for the patient was done using a straightforward procedure. The materials used for recording the primary & secondary impression, fabrication of trial dentures, and recording the neutral zone are all readily available and accessible to manipulate and use. This allows the clinician to evaluate and achieve the neuromuscular dynamics of the oral and perioral musculature and establish a harmonious neutral zone where the fabricated complete denture prosthesis shall exist.

Conclusion:

Though with the advancement of the newer techniques and procedures for rehabilitation of completely edentulous patients such as implant-retained overdenture, implant-retained fixed prosthesis, hybrid prosthesis, etc., the conventional denture prosthesis using neutral zone technique would primarily remain the least cumbersome procedure. Readily available chairside materials with easy manipulation were used to achieve satisfactory results. This treatment procedure was more economical to the patient and had better patient acceptance. It gives the clinician and patient time and a chance to gradually

formulate a better-fixed rehabilitation procedure.

References:

1. Beresin VE, Schiesser FJ. The neutral zone in complete dentures. *J Prosthet Dent*. 2006; 95: 93-100.
2. Beresin VE, Schiesser FJ, editors. *Neutral Zone in Complete and Partial Dentures*. 2nd ed. St. Louis: Mosby; 1979. p. 15, 73-108, 158-83.
3. Fish EW. An analysis of the stabilizing factors in full denture construction. *Br Dent J* 1931; 52:559-70.
4. Tambe A, Patil SB, Bhat S, et al. Cross-arch arrangement in complete denture prosthesis to manage an edentulous patient with oral submucous fibrosis and abnormal jaw relation. *Case Reports* 2014;2014:bcr2013203065.
5. Chaturvedi S, Abdelmonem AM, Haralur S, Suleman G, Majeed MI, Alfarsi MA. An in vivo study to compare location of neutral zone recorded with two materials. *J Contemp Dent Pract*. 2019; 20: 239-246.
6. Fish EW. *Principles of full denture prosthesis*. 7th ed. London: Staples Press, Ltd; 1948
7. Porwal A, Sasaki K. Current status of the neutral zone: a literature review. *J Prosthet Dent*. 2013 Feb;109(2):129-34.
8. Rinaldi P, Sharry J. Tongue force and fatigue in adults. *J Prosthet Dent* 1963; 13:857-65
9. Fahmy FM, Kharat DU. A study of the importance of the neutral zone in complete dentures. *J Prosthet Dent* 1990; 64:459-62.
10. Cagna DR, Massad JJ, Schiesser FJ. The neutral zone revisited: From historical concepts to modern application. *J Prosthet Dent* 2009; 101:405-12.
11. Longhini D, de Melo Rocha CO, Pereira Rd, Adabo GL, Arioli Filho JN. Neutral zone concept applied in implant supported mandibular complete denture treatment of a retrognathic patient. *J Dent Implant* 2017;7:59-63.
12. Barrenäs L, Odman P. Myodynamic and conventional construction of complete dentures: A comparative study of comfort and function. *J Oral Rehabil* 1989;16:457-65.
13. Lott F, Levin B. Flange technique, an anatomic and physiologic approach to increased retention, function, comfort, and appearance of denture. *J Prosthet Dent* 1996;16:394-413.
14. Fahmi F. The position of the neutral zone in relation to the alveolar ridge. *The Journal of Prosthetic Dentistry*. 1992;67(6):805-9.
15. Lammie GA. Aging changes in the complete lower denture. *J Prosthet Dent* 1956;6:450-64.

FIGURES

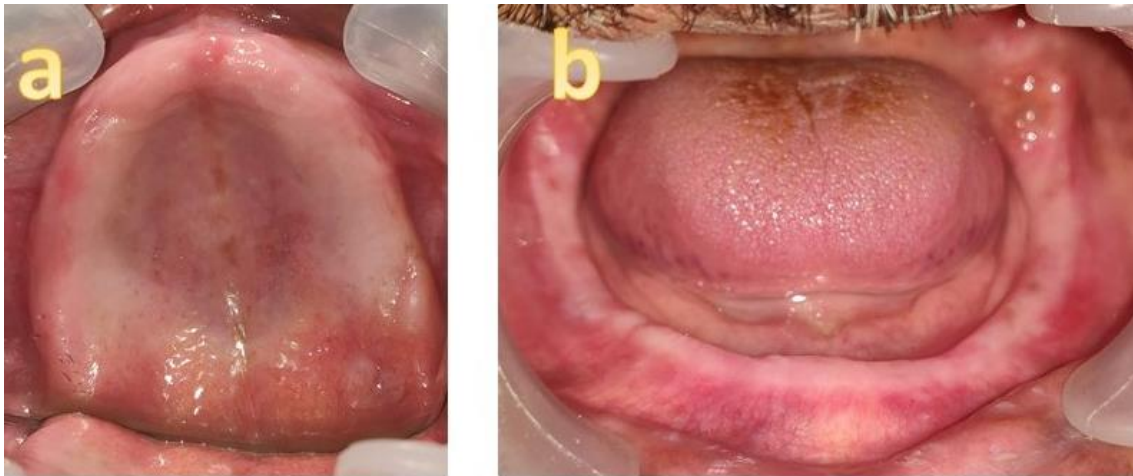


Figure 1 a and b

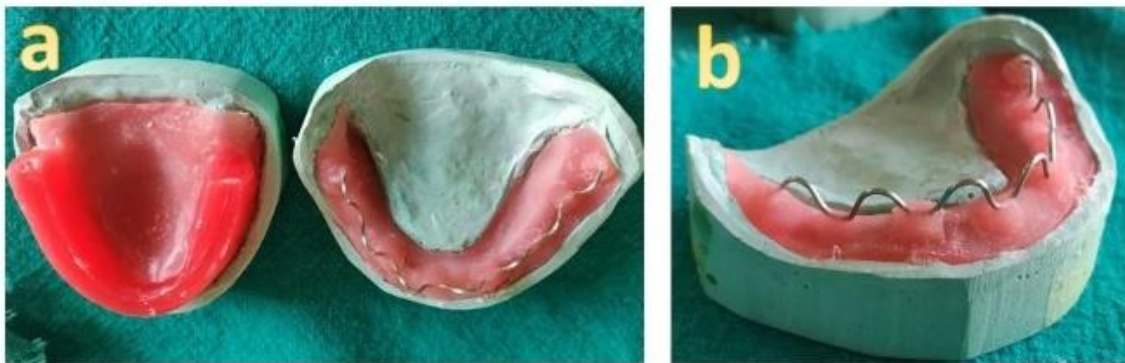


Figure 2 a and b

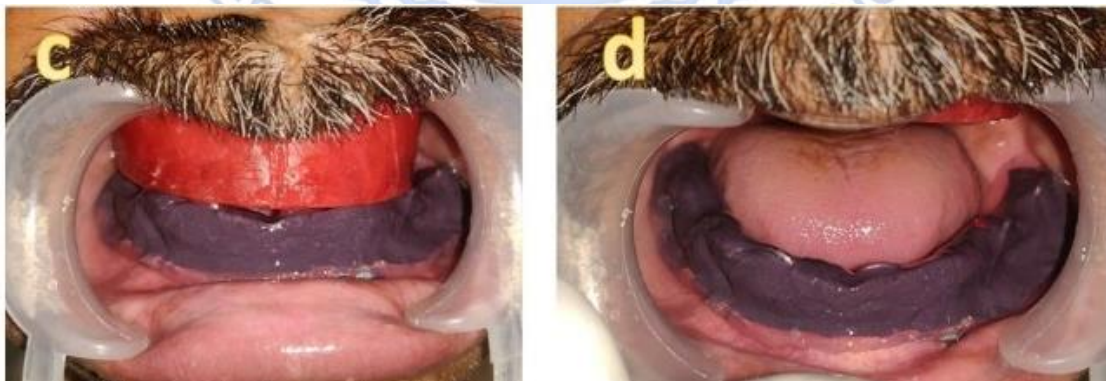


Figure 2 c and d

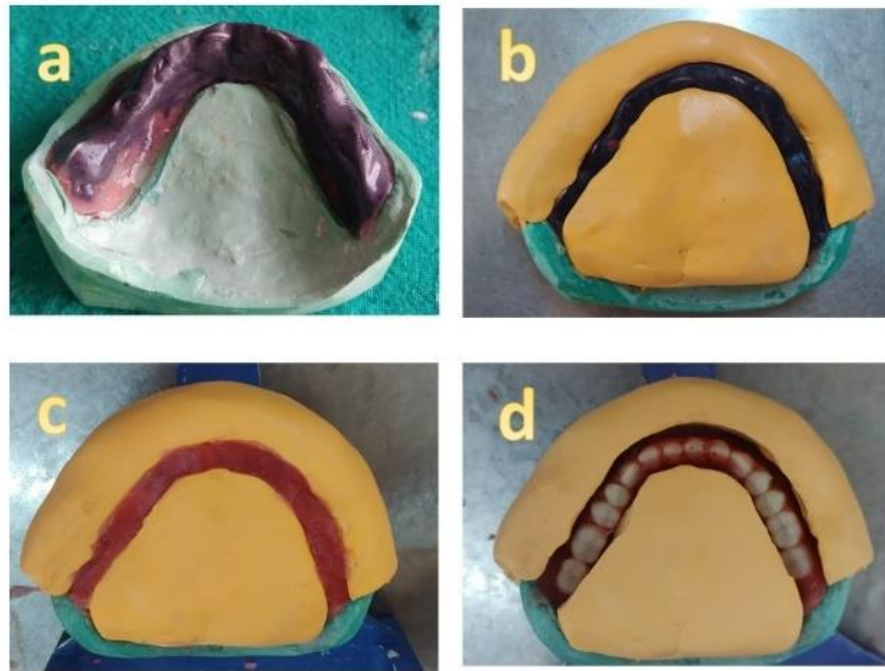


Figure 3 a, b, c and d

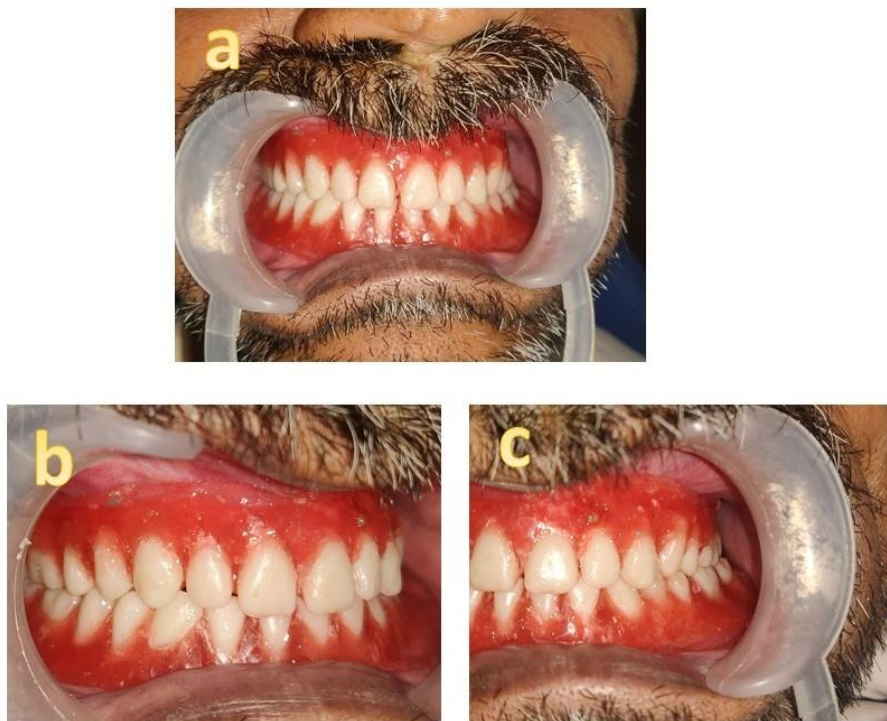


Figure 4 a, b and c.



Figure 5 a, b and c.

