

Utilization of neutral zone concept in an edentulous geriatric patient with neuromuscular incoordination and resorbed ridges- A case report

Kaustubh Bhapkar ¹

Sunil Kumar MV ²

Harikesh P Rao ³

Rajesh Kumar ⁴



Utilization of neutral zone concept in an edentulous geriatric patient with neuromuscular incoordination and resorbed ridges- A case report

ABSTRACT

The foremost objective of any prosthodontic service is to restore the patient to normal function, contour, esthetics, speech and health. Mandibular atrophic ridge is a challenging scenario for a clinician during fabrication of complete dentures. The denture loses its retention and stability due to severe mandibular ridge resorption and complex neuromuscular control. The neutral zone concept is very useful as it obtains muscle control, especially by tongue, lips and cheeks leading to denture stability. This clinical report describes the prosthodontic management of a severely resorbed mandibular ridge using the admix technique of neutral zone registration to accommodate stability in a mandibular complete denture prosthesis.

KEYWORDS – Admix technique, edentulism, neutral zone, resorbed ridge, stability.



INTRODUCTION

The primary goal of a complete denture therapy for patients with severely resorbed ridges includes maximum comfort, efficiency and esthetics.¹ Mandibular complete denture is most commonly unstable and less retentive due to a continuous, progressive residual ridge resorption. Hence the concept of neutral zone was formulated.

The neutral zone is a potential denture space in the oral cavity where the forces of tongue musculature pressing outward are neutralized by forces of the cheeks and lips pressing inward.² [Fig. 1] The two men who probably have contributed the most to this concept are Wilfred Fish and Russell Tench.² The major theory of neutral zone approach to complete dentures is to discover that region in the edentulous mouth where the teeth should be arranged such that forces exerted by muscles will tend to stabilize the denture rather than unseat it.³

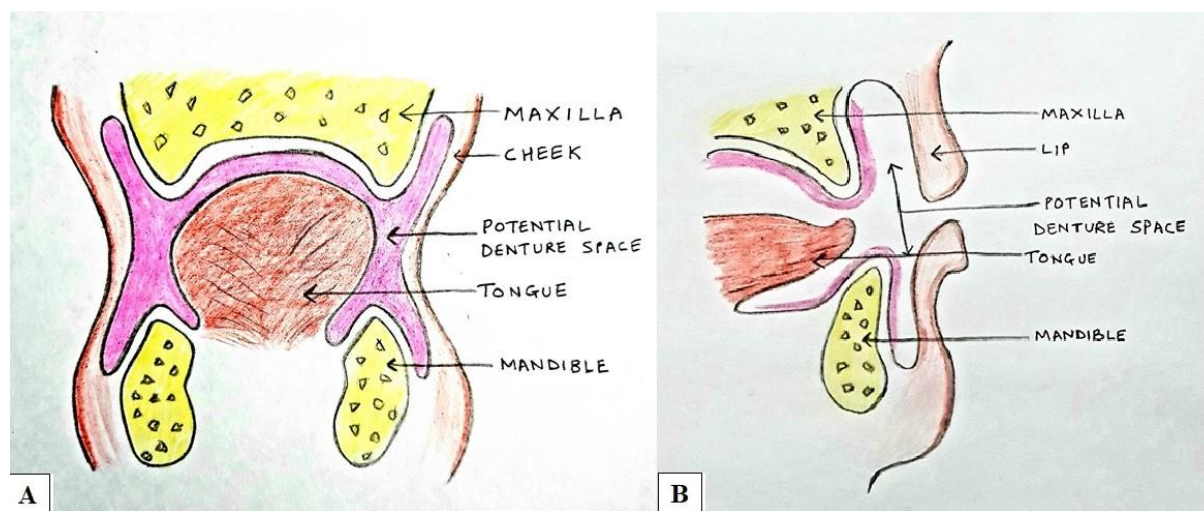


Fig. 1. Denture space (A) Cross-section in molar area (B) Lateral view

The denture consists of three surfaces namely the impression surface, the occlusal surface and the outer polished surface. In highly resorbed ridges, denture retention and stability depends on the outer surface.⁴

Regardless of the technique used, appropriate functional position of the facio-lingual denture teeth and a physiologically acceptable denture base contour must be implicated, failure of which will lead to poor prosthesis stability and retention, compromised phonetics, inadequate facial tissue support, inefficient tongue posture and function and hyperactive gagging.⁵



The present clinical report describes the prosthodontic management of a severely resorbed mandibular ridge using the admix technique of neutral zone registration to accommodate stability in a mandibular complete denture prosthesis.

CASE REPORT

A 70-old-male reported to the Department of Prosthodontics with a complaint of his previous ill-fitting denture and poor neuromuscular incoordination. On clinical examination, the mandibular residual ridge was unfavourable due to a high degree of resorption (classified as Atwood's Order V - low and well-rounded).⁶ [Fig. 2] The neutral zone recording using an admix technique (impression compound mixed with a green stick in the ratio of 3:7) was planned.



Fig. 2. Severely resorbed mandibular

Treatment Plan

1. Primary impression and diagnostic cast.
2. Secondary impression and master cast.
3. Record base fabrication and its modification.
4. Neutral zone recording.
5. Putty index, arrangement of teeth and try-in.
6. Denture processing.



Treatment Procedure

Primary impressions were made using impression compound (Pinnacle, DPI, Mumbai, India). The diagnostic casts were fabricated using type II dental stone (Kalstone, Kalabhai Karson Pvt. Ltd, Mumbai, India).

Border moulding was done with admix material by mixing three parts by weight of impression compound and seven parts by weight of tracing compound (DPI Pinnacle tracing stick, Dental Products of India, Mumbai, India) [Fig. 3]. The master cast were poured in type III dental stone (Kaldent; Kalabhai Karson Private Limited, Mumbai, India).

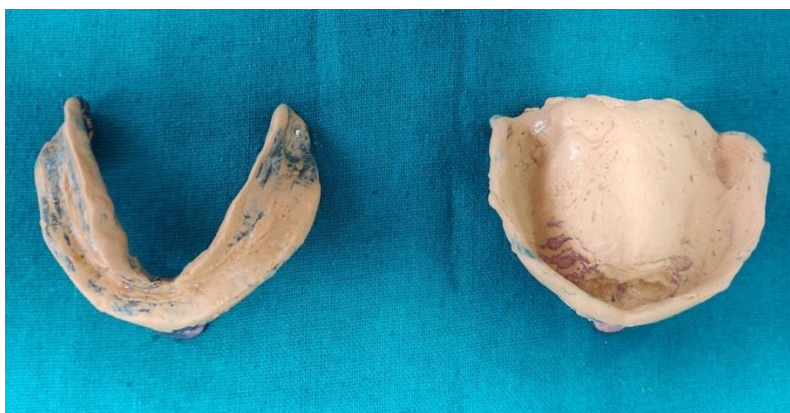


Fig. 3. Maxillary secondary impression using conventional technique and mandibular secondary impression using admix material

The record bases were fabricated for both jaws using autopolymerising acrylic resin (DPI-RR Cold Cure, Dental Products of India, Mumbai, India). Wax rims were constructed on the record bases following which tentative maxillo-mandibular relation was recorded. After the jaw relations were established, the lower denture base was adjusted to the recorded dimensions with softened compound and green stick in the ratio of 3:7.

The lower denture base with the softened impression compound and green stick was placed in the patient's mouth and patient was asked to swallow, drink some water, whistle, pursue the lips, etc. After about 5-10 min, the set impression was removed from the mouth and analysed. [Fig. 4] The functional movements were reproduced on the compound, which had gradually molded into a state of neutral balance.



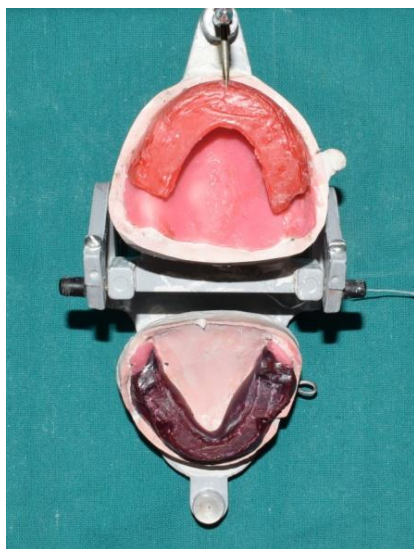


Fig. 4. Functional movements recorded in the mandibular occlusal rim using admix material

The maxillary and mandibular occlusal rims were articulated and putty index was made using addition silicone putty (Zhermack elite P&P Putty Addition Silicone, Badia Polesine, Italy) for the lower compound rims to recover the occlusal rims in wax. [Fig. 5(A)] The base and the catalyst were hand-mixed in an equal ratio and adapted to the facial and lingual surfaces of lower compound rims seated on its casts without covering the occlusal surface. After complete set, the impression material was carefully removed from the compound rims. The denture contours was now permanently registered in these putty indices.

The impression compound was then eliminated down to the bare acrylic resin. [Fig. 5(B)] The putty index was carefully placed back on the record base in its original position and sealed with baseplate wax to prevent leakage. The baseplate wax was gradually melted and poured into the index through the space between the labial and lingual indices on the occlusal surface. [Fig. 5(C)] When the index was opened, a hard wax duplicate of the low fusing compound was retrieved. Thus, the lower wax occlusal rims were formed. The teeth arrangement was completed using the index as a guide for positioning in the neutral zone. [Fig. 5(D)]



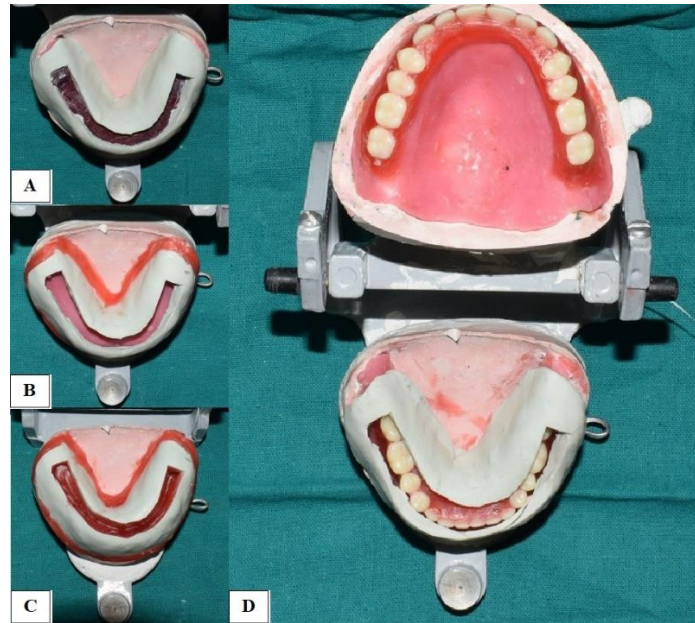


Fig. 5. (A) Putty index made around the recorded neutral zone (B) Impression compound removed down to the bare acrylic resin (C) Red baseplate wax poured into the index (D) Teeth arrangement done in the neutral zone

The wax trial dentures were tried in the mouth to check the esthetics, phonetics, and occlusion. [Fig. 6(A)] After finishing and polishing, the denture was inserted and post-insertion instructions were given. [Fig. 6(B)]



Fig. 6. (A) Try-in done (B) Denture insertion



Discussion

Residual ridge resorption (RRR) is a progressive, irreversible, and debilitating disease, likely of multifactorial origin.⁷ The neutral zone technique is favourable for patients with unstable and unretentive mandibular complete dentures.⁸ An implant-supported overdenture is an alternative option but was not considered due to the cost, duration and the patient's age.

The technique described in this article offers the added advantage of recording the physiological dynamics of oral and perioral muscle function in a simplified manner. Acrylic stops were used to check the vertical dimension of occlusion, and the neutral zone was recorded using the swallowing technique. The mean value articulator was appropriate in this case due to the patient's history of neuromuscular incoordination.

In this case, admix material was the preferred substance for border moulding and secondary impression as it permits the patient to mould the neutral zone within the least amount of time and effort. The admix material also helps mould the peripheral tissues, removes any soft tissue folds, and contours them over the mandibular bone during the impression procedure.

Neutral zone can be recorded using various materials such as impression compound, tissue conditioners, waxes and impression plaster.⁸ Admix material was used for recording the neutral zone as the patient suffered from neuromuscular incoordination depriving the oral muscles to perform efficiently. Admix technique is a combination of impression compound and green stick (low-fusing) compound in the ratio of 3:7. The mixture resulted in a low viscosity material allowing for ease in manipulation of the oral musculature, better flow and an accurate impression.

During earlier days, the arrangement of artificial teeth was recommended to occupy the position of natural teeth. Recently, the neurocentric concept has been applied for posterior mandibular teeth arrangement to occupy as central a location as possible, relative to the denture foundation, without disturbing adequate tongue function to facilitate denture stability during occlusal loading.⁹

The two important objectives of arranging artificial teeth within the neutral zone are: (1) prosthetic teeth do not impede with normal muscle function; and (2) normal oral and perioral muscle activity induces force against the complete dentures that serves to stabilize and retain the prostheses rather than cause denture displacement.¹⁰

The neutral zone varies from person to person depending on the musculature and resorption pattern. Therefore, the neutral zone concept helps to attain utmost stability and retention against varied muscular forces.



CONCLUSION

Better speech and comfort with neutral zone denture was expressed by the patient. The neutral zone functionally contoured all the external surfaces of the denture which thus influenced the dentures functional abilities. Hence, neutral zone concept can be utilized to improve mastication, comfort and esthetics for a completely edentulous patient with an atrophic mandibular ridge and neuromuscular incoordination.

REFERENCES:

1. Bhorgonde D, Nandakumar K, Khurana PR, Kumari VS, Reddy MS, Siddique S. An evaluation of the position of the neutral zone in relation to the crest of mandibular alveolar ridge - An In-vivo study. *J Int Oral Health* 2014;6(2):45-54.
2. Beenu V, Kattak AKS, Pattath VS, Nair SJ, Das R, Sreelekshmi MS. Is Neutral Zone, Patients Comfort Zone? A Feedback Review. *J Pharm Bioallied Sci.* 2020 Aug;12 (Suppl 1):S2-S5.
3. Beresin VE, Schiesser FJ. The neutral zone in complete dentures. *J Prosthet Dent.* 1976 Oct;36(4):356-67.
4. Murphy WM. The neutral zone and the polished surfaces of full dentures. *Dent Pract Dent Rec.* 1966;16:244-8.
5. Agrawal KK, Singh SV, Vero N, et al. Novel registration technique to register neutral zone. *J Oral Biol Craniofac Res.* 2012;2(3):198-202.
6. Jacobson TE, Krol AJ. A contemporary review of the factors involved in complete dentures. Part II: stability. *J Prosthet Dent.* 1983;49:165-72.
7. Singh OP, Kaur R, Nanda SM, Sethi E. Residual ridge resorption: A major oral disease entity in relation to bone density. *Indian J Oral Sci* 2016;7:3-6.
8. Saravanakumar P, Thirumalai thangarajan S, Mani U, et al. Improvised Neutral Zone Technique in a Completely Edentulous Patient with an Atrophic Mandibular Ridge and Neuromuscular Incoordination: A Clinical Tip. *Cureus* 2017;9(4):e1189.
9. Gupta KL, Agarwal S. Salvation of a severely resorbed mandibular ridge with a neutral zone technique. *Indian J DentRes* 2011;22:883.
10. Cagna DR, Massad JJ, Schiesser FJ. The neutral zone revisited: from historical concepts to modern application. *J Prosthet Dent.* 2009 Jun;101(6):405-12.



PARTICULARS OF CONTRIBUTORS:

1. Dr. Kaustubh Bhapkar, Postgraduate student, Jaipur Dental College, Jaipur.
2. Dr. Sunil Kumar MV, MDS, Professor and PG Director, Jaipur Dental College, Jaipur.
3. Dr. Harikesh P. Rao, MDS, Professor and HOD, Jaipur Dental College, Jaipur.
4. Dr. Rajesh Kumar, MDS, Professor, Jaipur Dental College, Jaipur.

DEPARTMENT AND INSTITUTION:

Department of Prosthodontics, Crown and Bridge and oral Implantology, Jaipur Dental College, Jaipur, Rajasthan, India

CORRESPONDING AUTHOR:

Name - Dr. Kaustubh Bhapkar

Address – 85, Anurag Nagar, Part-2, Indore, Madhya Pradesh, 452010.

Contact - 7748888869

E-mail address – kaustubh.bhapkar25@gmail.com



