

2-D Comparison in Neutral Zone Recording Techniques. (Phonetics & swallowing techniques)

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Abstract: Masticatory function requires a unique coordination with muscles and oral structures. If the denture is placed in a zone where the displacing forces of tongue, lips, cheeks and modulus are balanced, then the denture will be retained more effectively during function. This zone is known as neutral zone. If the denture stays outside/inside the neutral zone it will be unstable during the activities such as talking, swallowing and mastication. The neutral zone technique is used to minimize the displacing forces of the surrounding structures. This is a case study in which neutral zone recording techniques were compared to solve the problems of denture instability.

Keywords: Instability, Atrophic Ridge, Muscle Function, Neutral Zone

Background:

Material and Method:

Results:

Conclusion:

Keywords:

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I. Introduction

In Completely edentulous patients, ridge resorption continues as age advances. The greater the ridge resorption, the smaller the denture base area, leads to compromised stability and retention. To overcome this problem, dentures are fabricated with their contours harmonizing neutral zone.

According to GPT- 9, "The 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."

The success of the complete denture treatment depends mainly upon the proper positioning of the teeth on the denture foundation. Sir Wilfred Fish of England described neutral zone concept in 1931. Fish emphasized on the concept of neutral zone that is the zone of equilibrium in which the outward forces exerted by tongue counter balance the inward forces of lips and cheeks in complete denture construction. Resorption of mandibular ridge occurs from the lingual plate allowing for more space for tongue movement leading to tongue enlargement over the years. It is not only a treatment of choice in atrophic mandible but also in patients with partial glossectomy, mandibular resections or motor nerve damage to the tongue which have led to either atypical movement or an unfavourable denture bearing area.

The cheek and lip muscles lose their tonicity with the advancing age. Leads to shift of the neutral zone more towards the buccal and labial sides. Accurate recording of this zone and arranging the teeth in this zone is very important in increasing the denture stability. Various materials have been suggested for shaping the neutral zone namely modeling plastic impression compound, soft wax, impression plaster, a polymer of dimethyl siloxane filled with calcium silicate, silicone, tissue conditioners and resilient lining materials. Many techniques have also been suggested using the materials in conjunction with movements including sucking and pursing the lips along with phonetics & swallowing.

This present article describes the fabrication of a complete denture using neutral zone recording techniques for enhanced stability and masticatory efficiency.

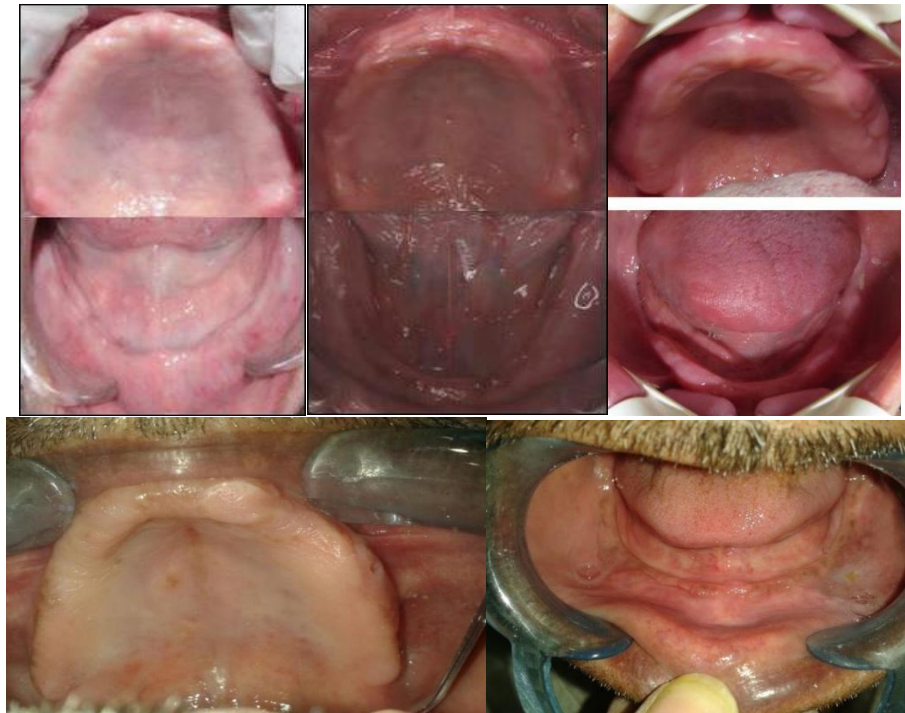


Figure - 1: Intraoral images of Edentulous Arches.

II. Materials and Method

This prospective comparative study was carried out on patients of Department of Prosthodontics at ,Kalka Dental College Meerut , Uttar Pradesh from April 2019 to November 2019. A total 4 completely edentulous geriatric subjects (both male and females) of aged ≥ 60 , years were selected in this study.

Study Design: Prospective comparative study

Study Location:, Kalka Dental College Meerut , Uttar Pradesh

Study Duration: April 2019 to November 2019.

Sample size: 4 patients.

Procedure methodology:

Primary impression: A primary impression for maxillary ridge and mandibular ridge was recorded using impression compound (Y-Dent) on metal stock tray. The primary impression was poured with dental plaster (Dent kaldent). On primary cast, custom tray was fabricated.(Figure - 2)



Figure - 2 : Primary Impression

Figure - 3 : Wash Impression

Final impression: The sectional border moulding was done for both maxillary and mandibular and wash Impression recorded using secondary Impression paste (DPI).(Figure - 3)

Jaw relation: Two sets of autopolymerising denture base were fabricated. On one set wax rims were fabricated. Horizontal and Centric jaw relation was recorded. Facebow record was made to orient maxillary cast on articulator (Hanau). The Mandibular cast is mounted using the centric relation record.



Figure - 4 : Face Bow Transfer



Figure - 5 : Jaw Relation

Recording neutral zone:

First Technique:

The mandibular wax occlusion rim was removed and retentive wire loops were attached to the record base in the premolar and molar area. Wires were adapted in the record bases for reinforcement to maintain the vertical dimension. (Figure 6).



Figure - 6: Neutral Zone Recording by using Phonetics Technique (PNZ).

Second Technique:

Low fusing impression compound was manipulated and adapted on mandibular denture base. With whole assembly placed in mouth's patient was asked to purse lips, count from 60 to 70, smile, grin, pronounce the vowels, swallow, slightly protrude the tongue and lick the lips until the material has set. A wash impression with zinc oxide eugenol paste (DPI-Impression Paste) was made to record the Neutral zone (Figure 7). On articulator, dental plaster index was made in three sections right buccal, left buccal, lingual around neutral zone impression.



Figure - 7: Neutral Zone Recording by using Swallowing Technique (SNZ).

Teeth arrangement: Molten wax was poured in neutral zone space. Mandibular occlusal rim height was adjusted according to previously recorded jaw relation. Semi-anatomic crossed-linked acrylic denture teeth for both anterior and posterior region were selected. These teeth were selected as they don't put more pressure on ridge thereby prevents underlying bone resorption and allows easy reshaping for occlusal adjustments. Mandibular anterior and posterior teeth were arranged according to plaster index (Figure 8). Complete teeth arrangement was done so as to provide multiple bilateral posterior contacts in centric relation. A protrusive interocclusal record was made to set the condylar guidance on the articulator. Anterior try-in was done and anterior guidance was set. Programming of articulator was done as lateral condylar guidance of 15°; horizontal condylar guidance of 25° and anterior guidance of 5° for balanced occlusion.



Figure - 8 : Teeth Arrangement

Try-in: Trial Dentures were evaluated to verify centric relation, occlusal vertical dimension and Balanced occlusion.



Figure - 9 : Try- In

Denture insertion: Dentures were fabricated, inserted and evaluated



Figure - 10 : Dentures Insertion

Graphical analysis:

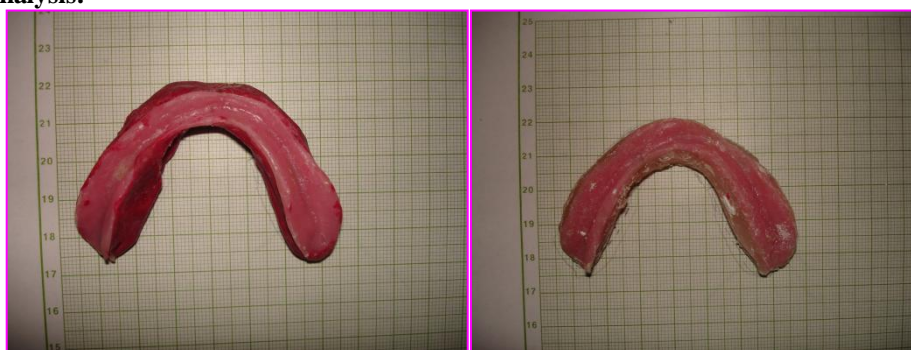


Figure - 11 : 2- Dimensional comparison in SNZ & PNZ Techniques.

Outlines compared- anterior , premolar , and molar

Plus (increase in thickness)

Minus (decrease in thickness)

Zero (no change in thickness)

Plus and minus (slight change in thickness).

III. Result:

When compared by segment ,buccally –molar and premolar regions where the SNZ was found to be located buccal to the PNZ .

Lingually ,significant differences in the right premolar region where the SNZ was located lingually to the PNZ.

IV. Discussion:

The ability of a denture to be firm, steady or constant, to resist displacement by functional stresses and not to be subjected to change of position when forces are applied defines stability. With severe resorption the muscular attachment comes nearer to the residual ridge affecting stability of mandibular denture more than maxillary denture. To overcome the problem of unstable denture, the neutral zone concept was introduced. Neutral zone is the space where the forces between the tongue and cheeks or lips are equal or neutralized¹⁰. It is used as a guide to develop physiologic contour for polished surfaces of the mandibular denture and for determining physiologically appropriate facio-lingual tooth position. The neutral zone technique is used to achieve retention and stability in atrophic mandibular ridges. Various materials have been used to record the neutral zone such as, waxes, impression plaster, impression compound, tissue conditioners, and polyether. The material should be reasonably slow setting to permit the oral musculature to shape it to the appropriate contour and dimensions. Adel AM et al, in 2019 conducted study to determine relationship between the crest of the alveolar ridge and neutral zone and to compare its location recorded by low fusing impression compound and tissue conditioner. They concluded that no significant difference was noted in the positions of neutral zone recorded in relation to the alveolar ridge crest¹¹. In this case study two commonly available materials namely, low fusing impression compound with zinc oxide eugenol paste wash and tissue conditioner were used to record the neutral zone. Low fusing impression compound is a thermoplastic material with low viscosity allowing ease in manipulation of oral musculature, better flow and good accuracy. Tissue conditioners are viscoelastic material they have long working time, good flow, longer durability and don't resist forces exerted by the surrounding tissues. Thus most accurate neutral zone position which is close to crest of ridge was recorded by

using the above two materials. Occlusion is one of the factors for enhancing the principles of denture. Balanced occlusion helps in directing the forces of mastication to aid in the balance and stabilization of the functioning mandibular denture. Thus, denture fabricated by neutral zone impression technique and balanced occlusion aids in retention and stabilization of the denture rather than dislodging the denture during function as well as reduced food lodgement, good esthetics due to facial support, proper positioning of the posterior teeth allowing sufficient tongue space⁴.

SNZ located buccally in molar –Two factors are responsible :-

- Compound might be too viscous
- Buccinator activity will be increased in speaking

PNZ located lingually in premolar- Contraction of the zygomatic , caninus, triangularis muscles, which meet at the modiolus.

V. Conclusion:

The coordination of complete dentures with neuromuscular function is the foundation of successful stable dentures. Neutral zone impression technique and type of occlusion are one of the factors aiding in stabilization and retention of the mandibular denture in severely resorbed ridge cases.

Within the limitations of the study , the findings indicated that the location of the neutral zone was not the same with the swallowing /modeling plastic impression compound technique and the phonation/tissue conditioner technique.

In general , the PNZ technique resulted in impressions where the neutral zone appeared to be narrower as the buccal surface was located more lingually compared to the SNZ technique.

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