Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 20s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Innovative Technique to Record Neutral Zone for Complete Dentures Using Light Cure Tray Material

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Cite this paper as: Dr. Triveni Dighe, Dr V.N.V Madhav, Dr. Snehal Joshi, Dr. Apurva Lambat, Dr. Atharva Kamble, Dr. Khushbu Patel, (2025) Innovative Technique to Record Neutral Zone for Complete Dentures Using Light Cure Tray Material. *Journal of Neonatal Surgery*, 14 (20s), 598-602.

ABSTRACT

In resorbed or atrophic ridges, it is very challenging to achieve denture retention because of the loss of bone support. The denture must have some stability in the oral cavity, so the neutral zone technique was developed. Here the inward forces from the cheeks and lips are neutralized by the outward forces from tongue. This creates a zone or area where these forces are balanced, which was known as neutral zone

Keyword: *Neutral Zone, Light cure tray material, Complete denture*

1. INTRODUCTION

With total edentulousness, a space is created within the oral cavity, known as the potential denture space. The neutral zone is the region within this space where the external forces exerted by the tongue are balanced by inward forces of the cheeks and lips. These forces result from muscular contractions during essential functions such as chewing, speaking, and swallowing. Since muscle activity varies among individuals, the magnitude and direction of these forces also differ accordingly.[1]

Various terms have been used to describe the neutral zone: *Russel* called it the “reciprocal space,” *Robert* referred to it as the “potential space,” *Heath* termed it the “denture space,” *Bates* named it the “reciprocal zone,” *Mathew* described it as the "zone of minimum conflict," and *Fenn* referred to it as the “zone of neutral muscular forces” [2]

Recording this zone is crucial in patients with severely resorbed ridges, where conventional denture stability is compromised. Different materials, including tissue conditioners, impression compounds, waxes, and impression plaster, are proposed for this purpose, each with distinct advantages and limitations.[3] This article mentions about light cure tray material to record neutral zone which is dimensionally stable, easy to use and simpler method

CASE REPORT

A 75-year-old male reported to Department of Prosthodontics with primary complaint of ill-fitting denture and wanted to get it replaced with new one. The patient was edentulous for 12 years and had previously used 3 sets of dentures (Fig.1). The most recent one was fabricated one year ago using conventional techniques, the denture was ill-fitting and unsatisfactory. Medical history revealed that patient was hypertensive and on medication for the same.

Intraoral examination revealed well rounded maxillary ridge and severely resorbed, flat mandibular ridge. The clinical assessment of mucosa and palpation of areas adjacent to potential denture peripheries was carried out. Considering the condition of mandibular ridge, neutral zone technique was decided for the available oral status.

Fig 1. Pre-operative photograph

PROCEDURE

1. Primary impressions were made for both maxillary and mandibular arches using impression compound (Maarc Dental, India), and primary casts were prepared.
2. Special trays were fabricated using auto polymerizing resin (Dental Products of India). Border molding was performed with green stick impression compound sticks (Maarc Dental, India), followed by final impressions using zinc oxide eugenol material (DPI-Impression paste). The master casts were poured in dental stone.
3. The maxillary and mandibular occlusal rims were fabricated using modelling wax. Maxillary rim was inserted and parallelism with ala-tragus line was checked. The orientation of maxilla to the base of the skull was recorded using facebow and transferred to Hanau articulator. Mandibular rim was inserted and the vertical dimension at rest and at occlusion was determined. The casts were mounted on articulator using centric relation position.
4. The wax on lower occlusal rim was removed. One vertical occlusal stop was made in the anterior region and two in the first molar region using self-cured acrylic resin.
5. Light-cured tray material (Plaque Photo-MR Dental Light Cure Trays) was placed on the rest of the base plate and around the vertical occlusal stops.
6. The patient was instructed to perform functional movements like swallowing, drinking water several times, licking, pursing his lips, talking, whistling, sucking, smiling, etc. These dynamic movements were carried out for 5-10 minutes to simulate functional oral activity. Following this, the record base was carefully removed and evaluated for accuracy and stability. It may be a bit difficult to mold light-cure sheets in the neutral zone due to their rigidity. (Fig. 2)
7. The Delta Blu-Lux light curing unit with 450nm wavelength was used to cure the neutral zone impression. (Fig. 3)
8. Three indexing notches were created on the cast - one in anterior region and two posteriorly, to facilitate the precise articulation of silicone putty indices. Silicone putty (Zetaplus, Zhermark Dental) was used to form indices on buccal and lingual surfaces around the neutral zone which helps to capture the contours of the neutral zone.
9. A new record base was fabricated on a mandibular cast with self-cured acrylic material. Indices were kept in place

using indentations of notches. Subsequently, wax was introduced into space corresponding to the neutral zone which formed the occlusal rim.

10. The lower teeth were arranged according to the neutral zone record and checked with putty indices. The upper teeth were subsequently arranged. (Fig. 4)
11. Try-in procedure was performed to check stability, esthetics and phonetics of trial denture. And finally, the trial denture was flasked and acrylised and delivered to the patient. (Fig. 5)

Fig 2. Neutral Zone Registration

Fig 3.Delta Blu-Lux light-curing unit.

Fig 4. Teeth arranged in neutral zone

Fig 5. Postoperative photograph

2. DISCUSSION

The placement of artificial teeth should be guided by the surrounding musculature, which varies among individuals. Arranging teeth within the neutral zone serves couple of primary objectives: one, to prevent interference with physiologic muscular activity, and second, to optimize distribution of muscular activity on dentures, thereby enhancing their stability and retention.

Mandibular dentures often exhibit reduced stability compared to maxillary dentures, especially in geriatric patients, due to factors such as increased life expectancy, age-related decline in neuromuscular control, and advanced residual ridge resorption. To address these challenges in severely atrophic mandibular ridges, a modified technique was utilized to enhance denture retention and stability.[5]

Kursoglu recommended tissue conditioners for recording neutral zones. However, due to their low viscosity, handling remains challenging, even when reinforced with wire loops. It is a mucostatic material that exerts minimal pressure on soft tissues, unlike impression compound. Being odorless and tasteless, it is better tolerated by patients compared to zinc oxide eugenol paste. Its ability to allow incremental additions makes suitable for accurately recording neutral zone. The long setting time permits adequate functional movements during muscle molding procedure.[4]

With Time, different materials have been utilized for recording the neutral zone, including impression plaster, waxes, tissue conditioners, and polyether. Impression compound due to its high viscosity, restricts the effective execution of functional movements such as blowing, lip pursing, and sucking. Impression plaster presents handling difficulties and poses a risk of accidental ingestion of fragmented material during physiologic actions. Achieving even softening of wax rims is crucial for accurate functional recording; improper softening may lead to distortions in the neutral zone impression. Tissue conditioners lack sufficient structural integrity, making them challenging to manipulate, even when reinforced with wire loops. Polyether impression material undergoes a chemical setting reaction, limiting its ability to be modified or reused once set.[3]

3. CONCLUSION

This article presents an innovative and simplified approach to recording the neutral zone using light cure tray material. The use of light cured resin tray for determining the neutral zone provide good dimensional stability to the neutral zone impression. This technique enhances the mastication, stability of dentures and comfort for patients. Recording the neutral zone using light cure tray material is an easy and economically feasible treatment option for highly resorbed ridges.

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