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A Novel Prosthodontic Treatment Approach Towards Resorbed Mandibular Ridges

Dr Gibi Babu Philip[1],Dr Manish Jhamb[2],Dr Emi George[3],Dr Rachna Jhamb[4]
[1](Assistant Professor, Department Of Prosthodontics, Azeezia College Of Dental Science & Research, India)
[2](Private Practitioner, Vishal Dental Clinic, India)
[3](Department Of Conservative Dentistry, Azeezia College Of Dental Science & Research, India)
[4](Private Practitioner, Vishal Dental Clinic, India)

Abstract: *The most common problems among long term denture wearers is the unstable complete mandibular denture .Complete dentures are primarily mechanical devices, but since they function in the oral cavity, they must be in harmony with normal neuromuscular function, oral functions such as speech, mastication, swallowing, smiling, and laughing which involves the synergistic actions of the tongue, lips, cheeks, and floor of the mouth. . In order to have a favourable prognosis for the denture therapy, impression technique selected should be proper. In Neutral Zone Technique, the forces exerted by muscles of tongue and the cheek will tend to stabilize the denture rather than unseat it*

Keywords: *Stability, Mandibular denture, Neutral Zone, Impression*

I. Introduction

WHO's World Statistics Report 2016 stated that life expectancy in India has gone up by five years, from 62.3 years for males and 63.9 years for females in 2001-2005 to 67.3 years and 69.6 years respectively in 2011-2015 which could lead to a rise in the number of edentulous patients. It is estimated that 7% - 69% of adult population are completely edentulous.[1] The dentist plays an important role in helping the patients to keep their teeth in healthy condition throughout their life. If the teeth are lost despite of all the efforts to save them, then a restoration should be made such that they function efficiently and comfortably in harmony with the muscles of the stomatognathic system. The treatment of these complex cases may need to move away from traditional denture construction. The mandibular denture commonly presents the most difficulties with pain and looseness being the most common complaint.[2] This is because the mandible atrophies at a greater rate than the maxilla and has less residual ridge for retention and support.[3] The neutral zone technique is most effective for patients who have had numerous unstable, non retentive mandibular complete dentures[4]. These patients usually have a highly atrophic mandible and there has been difficulty in positioning the teeth to produce a stable denture.

The neutral-zone approach in complete denture fabrication was contributed by Wilford Fish[5] and Russell Tench.[6] Many others,[7] have helped to advance and develop both the theoretical basis and practical procedures. The term neutral zone concept was coined by Beresin and Schiesser in 1976[8].The neutral zone approach has also been used for patients who have had a partial glossectomy, mandibular resections or motor nerve damage to the tongue — which have led to either atypical movement or an unfavourable denture bearing area.[9] Dental implants placed with neutral zone technique stabilize the denture fabricated over atrophic mandibular ridge. It plays an important role in Preventive Prosthodontics[10] by delaying the bone resortion, mainly due to the implant biomaterial which is titanium.[11] However, there may be certain medical, surgical or economical conditions when it is not possible to provide implants. In such complex cases the neutral zone impression technique is the only option left for the stabilization of the complete denture.. This present article describes the fabrication of a complete denture using neutral zone impression technique for enhanced stability and masticatory efficiency.

II. Case Report

A 60-year-old male patient reported to the Dental College (Figure 1),with the chief complaint of inability to chew and impaired speech due to missing teeth in upper & lower arch from past 10 years .On examination, it was found that both the upper and the lower arches were edentulous and severely resorbed (Figure 2). The patient had a history of tooth loss as a result of decay and mobility. The treatment plan was explained to the patient and an informed consent was obtained from the patient. Primary impressions (Figure 3,4) were made with Impression compound (Aslate, Mumbai, India) The wash impressions were made in a custom tray with zinc oxide eugenol impression material (Dental Products of India Ltd, India). During recording of the secondary impression the patient was asked to open, swallow and speak so as to bring all the muscles into function. The obtained impressions were poured with dental stone. The record bases were fabricated, assessed

and modified for stability, extension and comfort. Occlusal rim was fabricated and a tentative jaw relation was recorded and articulation was done (Figure 5). After this, a wire was incorporated in the mandibular denture (Figure 6) , following this, an acrylic stop was constructed over the wire to maintain the vertical height (Figure 7).Now the patient was made comfortable in an upright position with the head supported. A rim was made with impression compound & green stick impression material mixed together (Green Impression Compound; Kerr Corp) was softened in a 650 C water bath. The softened compound was kneaded and was attached to the base. The attached roll of compound was reheated in the water bath and was carried into the patient's mouth. With the record base firmly seated, the patient was asked to perform a series of actions like swallowing, speaking, sucking, pursing lips, pronouncing vowels sipping water and slightly protruding the tongue several times which simulated physiological functioning. During function of the lips, cheeks, and the tongue, the forces exerted on the soft compound molds it into the shape of the neutral zone. After a few minutes when the compound has cooled, the record base with the compound rim is removed and placed in cool water bath.

Maxillary rim was oriented in the patient's mouth , the height of the lower compound rim was adjusted. The neutral zone impression(Figure 8) so obtained was placed on the master cast, locating grooves were cut on the master cast and was covered with a silicone putty index around the impression on both the labial and lingual sides (Figure 9).The compound occlusal rim was then removed from the base plate and the index is replaced. The index would have preserved the space of the neutral zone. Wax was poured into the space (Figure 10) .Teeth arrangement was done exactly following the index (Figure 11). Once the waxed up trial dentures were ready, they were checked in the patients mouth for aesthetics, phonetics and occlusion (Figure 12). Once the try-in was deemed satisfactory the dentures were processed and finished. Care was taken during finishing and polishing of the dentures so that the contours recorded previously were unaltered. During insertion the dentures are fully checked to eliminate any minor errors. The dentures provided the patient with improved facial appearance, stability and retention during function (Figure 13,14) as they have been constructed in harmony with their surroundings (Figure 15).

III. Discussion

Oral functions involve the unique interplay of the oral structures and muscles. The primary goal of any prosthodontic treatment is to restore the form, function, and esthetics of the patient. Fish[12] stated that there are three surfaces of the denture of which the polished surface of the denture should be a series of inclines so that pressure from muscular activity will retain the denture. Matthews [13] suggested that the correct shape for the polished surfaces of the mandibular denture was developed by the action of the musculature related to the denture.

The most commonly used technique for recording the neutral zone are swallowing[14] and phonetics.[15] Besides these, various other techniques can also be used such as sipping water, licking, smiling, pursing the lips, sucking, protruding the tongue, opening and closing of mouth and whistling etc.[16] Makzoume in a study compared between phonetics and tissue conditioner with swallowing and modelling compound in recording neutral zone[17]. And concluded that the phonetic neutral zone appears to be narrower posteriorly, limiting the position of premolar and molar. Lott and Levin,[18] stated that patients should be asked to read an interesting topic aloud and rapidly.This will make the muscles to strain and increase salivary secretion. This will result in more swallowing action, thus enabling patients to make more natural movements of the muscles Tench et al[19]used modelling impression compound for the first time to record neutral zone. Although this is widely followed, other materials such as tissue conditioner, wax, zinc oxide eugenol impression material, chair side relining material and acrylic resin are also used for this technique.[20] It is difficult to record neutral zone when the patient is not able to perform proper functional movements of the cheek, tongue, or lips. Bril[21] pointed out that the area of surface contact between the denture and the related tissues should be maximal to obtain maximal interfacial seal. This would seem to favor the concept of a denture composed of only occlusal and fitting surfaces. Dentures fabricated over a severely resorbed mandibular ridge by neutral zone impression technique will ensure that the muscular forces aid in the retention and stabilization of the denture rather than dislodging the denture during function.[22]

A denture shaped by the neutral zone (NZ) technique will ensure that the muscular forces are working more effectively and in harmony. The dentures will have other advantages like improved stability and retention, posterior teeth will be correctly positioned allowing sufficient tongue space, reduced food trapping adjacent to the molar teeth & good aesthetics due to facial support[23]. Clinicians must identify and record the neuromuscular dynamics of the oral tissues and this should be applied in the construction of the definitive prosthesis that will exist within the stabilizing boundary conditions of the neutral zone area

Figures

Figure 1. Pre-operative Photograph Figure

Figure2. Edentulous maxillary & mandibular arch

Figure 3. Maxillary arch impression

Figure 4. Mandibular arch impression

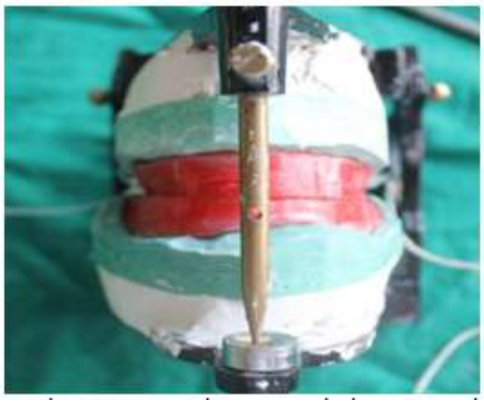

Figure 5. Tentative Jaw Relation

Figure 6. Wires incorporated into mandibular arch

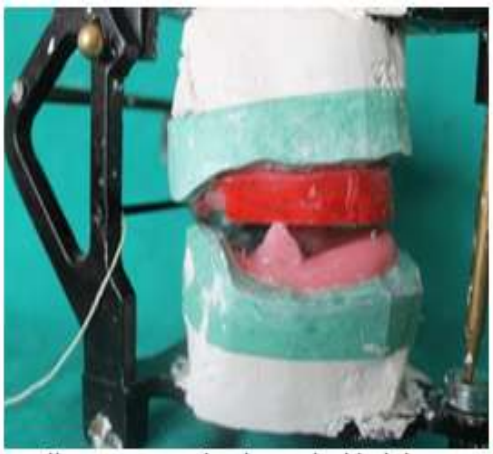

Figure 7. Acrylic stops to maintain vertical height

Figure 8. Mandibular molded compound rim


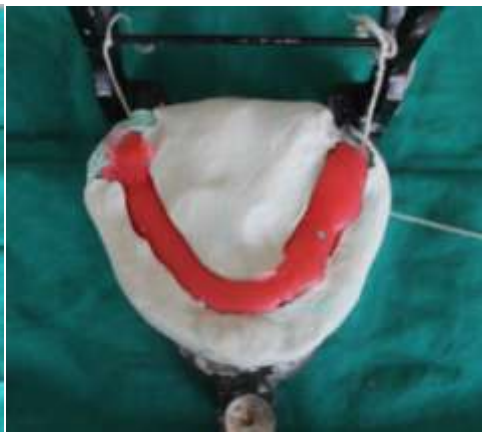

Figure 9. Putty index placed around rim,**Figure 10.** Putty indexed replaced with wax


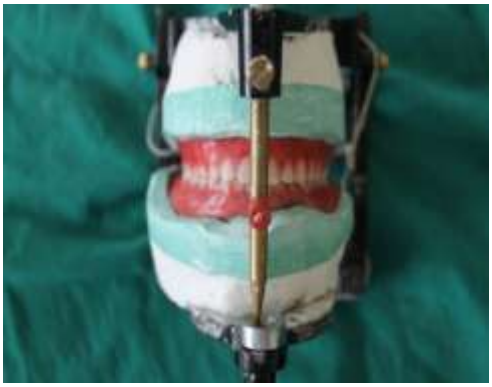

Figure 11. Teeth arranged in wax **Figure 12.** Teeth arrangement for Try in


Figure 13. Occlusion of Left side **Figure 14**. Occlusion on Right side

Figure 15. Post -operative Photograph

IV. Conclusion

The neutral-zone philosophy is based upon the concept that for each individual patient, there exists within the denture space a specific area where the function of the musculature will not unseat the denture and where forces generated by the tongue are neutralized by the forces generated by the lips and cheeks. The neutral zone is used for the construction of lower complete dentures on highly atrophic ridges. Regardless of the method of treatment , any part of the dentition out of harmony with neutral zone will result in instability, interference with function and cause discomfort. Thus neutral zone must be evaluated as important factor before any changes in arch form & alignment of teeth. The technique is relatively simple but there will be increased chair time and laboratory costs.

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