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Complete Denture with Neutral Zone Technique in Atrophic Mandibular Ridge- A Case Report

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Abstract:
Severely atrophied ridges pose a challenge in complete denture stability and comfort. The neutral zone technique is an approachusing which a denture is constructed such that it is in harmony with the surrounding musculature. In this paper a mandibular complete denture has been constructed using the neutral zone technique which uses the surrounding muscles balance to ensure adequate stability.
Key Word*: Neutral zone technique, complete denture, atrophic ridges*

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I. Introduction

The neutral-zone approach to complete denture construction is neither new nor original but rather, constitutes the bringing together of the concepts and ideas of many studies into a viable and practical procedure. According to the Glossary of Prosthodontic terms-9, the neutral zone is defined as, "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 the cheeks or lips are equal" [1]. Since the mandible atrophies at a faster rate than the maxilla, it offers less stability and support as compared to maxilla [2]. Complete dentures must be fabricated so that they are in harmony with normal neuromuscular function and the failure of which often results in dentures which are unstable. The main principle of the neutral zone approach in complete dentures is that the denture teeth should be positioned in an area in the edentulous mouth where the forces from the tongue and lips and cheek do not displace the denture but rather help in stabilizing it[3]. The neutral zone is that area in the potential denture space where the forces of the tongue pressing outward are neutralized by forces of the cheeks and lips pressing inward.

II. Case-Report

A female patient, aged 67 years, reported to the department of Prosthodontics with the chief complaint of a loose lower denture. On examination it was seen that the patient was completely edentulous in the maxilla as well (Fig.1 a). The intraoral examination revealed a highly resorbed mandible (Fig.1 b). The patient was explained about the impact of the resorbed ridge and was given various treatment options. Based on the patient's choice, a complete mandibular denture with a neutral zone approach was finalized.

Fig. 1(a) Edentulous maxillary ridge

Fig. 1(b) Atrophic mandibular ridge

III. Procedure

The treatment was begun with by recording the maxillary and mandibular preliminary impressions. The maxillary impression was made with a Type-II impression compound (Fig. 2a) and the mandibular impression was made using the admixed technique (Fig. 2b). The resultants casts were poured with dental plaster.

Custom trays fabricated using the primary casts were then used to do border molding with low fusing type –I green stick compound. The maxillary final impression was made with a light body PVS material (Fig.3a) and the mandibular impression was made with a zinc oxide – eugenol impression paste (Fig.3b). The resultant casts were poured with dental stone.

Denture bases were made using cold cure acrylic material. Orientation jaw relations were made using a facebow transfer and the maxillary cast was articulated on a semi adjustable articulator.

Retentive loops using orthodontic wire gauge 22 were made on the mandibular record base. In addition to the retentive loops, three acrylic stops were made on the anterior and posterior aspects of the mandibular denture base at the level of the occlusal plane (Fig. 4). The acrylic stops are made so as to ensure that they do not deflect the tongue or lips and cheeks as well as maintain the desired occlusal vertical dimension[4].

Fig. 2(a) Maxillary preliminary impressions

Fig. 2(b) Mandibular preliminary impressions

Fig. 3(a) Maxillary final impression

Fig. 3(b) Mandibular final impression

Clinical procedures in locating the neutral zone:

Tissue conditioner (D-Soft Tissue conditioner) (Fig. 5) was manipulated in a rubber cup and placed on the mandibular record base covering the retentive loops and up to the height of the acrylic stops. The patient's lips were lubricated with petrolatum jelly. The tray with the material was then placed in the patient's mouth. To record the neutral zone, the patient was instructed to perform physiological actions such as swallowing and then purse the lips as in sucking, smiling, counting between60-70, licking the lips and protruding the tongue until the material set. The stability of the baseplate was checked by asking the patient to repeat her movements. Once this was satisfied, the baseplate with the recorded neutral zone was removed from the patient's mouth and inspected (Fig. 6).

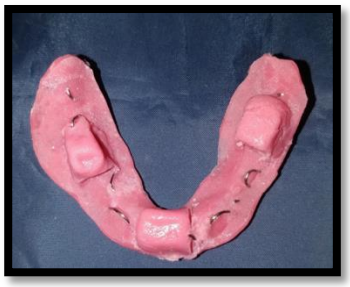

Fig. 4 Baseplate with acrylic stops and retentive loops

Fig. 5 Tissue conditioner

Laboratory procedures:

Once the neutral zone was recorded, the record base with the set material was removed from the mouth and inspected and placed on the cast. Two circular groves were created on both sides of the base of the cast which served as locating grooves.

The next step involved making an index using a PVS putty material around the recorded neutral zone extending to the base of the cast (Fig. 7).

The putty index was then cut through the retromolar area dividing it into two halves: the tongue area part and the external area part.

Once this was done, the index was set aside and the base plate was taken off the cast and the soft liner material was removed from the base plate.

After this, the base plate was replaced on the cast and the putty index was replaced and oriented in the right position with the help of the locating groves. The index will preserve and signify the position of the recorded neutral zone.

The next step involves making the occlusal rim. Modeling wax was melted and flowed over the base plate on the area in the putty index that has the recorded the neutral zone. Teeth arrangement was done in this area and can be verified with the help of the putty index(Fig. 8).

Fig. 6 Recorded Neutral zone

Fig. 7 PVS Putty index

Fig. 8 Mandibular occlusal rim

Wax try-in and denture insertion:

Once the occlusal rims were made, jaw relations and articulation were completed, the teeth arrangement was done. Teeth arrangement in the lower record base was done within the recorded neutral zone and can be checked by replacing the putty index (Fig. 9 a,b).

Post teeth arrangement, a clinical try-in procedure was carried out and once it was seen to be satisfactory then the waxed up denture was sent for final processing, followed by denture insertion (Fig. 10).

During the denture insertion appointment, occlusal high points eliminated and the denture stability and retention and appearance was checked (Fig. 11, 12) .

During the follow up appointment the patient returned satisfied with the fit and function of the new denture.

Fig. 9(a) Teeth arrangement in Neutral Zone

Fig. 9(b) Teeth arrangement

Fig. (10) Wax try-in

Fig. (11) Final Prosthesis

Fig. (12) Pre and post -operative view

IV. Discussion

The greater the ridge loss, the smaller the denture base area and the less influence the impression surface area will have on the stability and retention of the denture. Where more of the alveolar ridge has been lost, denture stability and retention are more dependent on correct position of the teeth and contour of the external surfaces of the dentures. In order to construct dentures which function properly in chewing, swallowing, speaking, etc., we must develop not only proper tooth position but also the fit and contour of the polished surfaces just as accurately and meticulously.

Many materials can be used to record the neutral zone: Modeling plastic impression compound, Soft wax[5, 8], polymer of dimethyl siloxane filled with calcium silicate[9], and tissue conditioners[4].In this case, a tissue conditioner was used to record the neutral zone.

Several studies were conducted to compare the efficiency between conventional dentures and dentures constructed with a neutral zone approach and it was concluded that the latter have shown increased stability, support, and patient comfort[6, 7].

V. Conclusion

The aim of complete denture constructed with a neutral zone technique is to ensure adequate stability and retention in severely atrophic edentulous ridges. Several studies and authors such as Fahmy et al[6] have proved that the muscle balance has a significant effect on the stability and retention of a denture. In this case, the patient found the new denture to be more comfortable while performing normal physiological functions.

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