Neutral Zone Technique for the Management of Unstable Mandibular Complete Denture: A Case Report

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Date of Receiving: 04/Jan/2013
Date of Acceptance: 15/Feb/2013

Abstract: Loose and unstable mandibular complete denture are one of the most common problems faced by the denture patients. This article describes technique for improving the stability of mandibular complete denture by using neutral zone. The main aim of neutral zone technique is to construct a denture that is shaped by the muscle function and is in harmony with the surrounding oral structure.

Key words: Neutral zone, Atrophic mandible, Impression, Index.

INTRODUCTION

Complete dentures are primarily mechanical devices, but since they function in the oral cavity, they must be fashioned so that they are in harmony with normal neuromuscular function. All oral functions, such as speech, mastication, swallowing, smiling, and laughing, involve the synergistic actions of the tongue, lips, cheeks, and floor of the mouth which are very complex and highly individual. The coordination of complete dentures with neuromuscular function is the foundation of successful stable dentures. When all of the natural teeth have been lost, there exists within the oral cavity a void which is the potential denture space. 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.

Providing complete denture therapy to patients with atrophic residual alveolar ridges is challenging. Because these patients suffer ongoing diminution of the denture foundation, modern approaches often involve dental implant therapy as a means of improving the denture foundation and supplementing the mechanics of prosthesis support, retention, and stability. Regardless of implant availability, physiologically optimal denture contours and physiologically appropriate denture tooth arrangement should be achieved to maximize prosthesis stability, comfort, and function for patients. This is because the mandible atrophies at a greater rate than the maxilla and has less residual ridge for retention and support.

Many materials have been suggested for shaping the neutral zone: modeling plastic impression compound, soft wax, a polymer of dimethyl siloxane filled with calcium silicate, silicone, and tissue conditioners and resilient lining materials.

Considering that a person swallows up to 2400 times per day, and considering also that during the entire swallowing sequence teeth come into contact for less than 1 second, it may be concluded that less than 40 minutes of tooth-to-tooth contact occurs per day during function. Speech is also another important part of daily oral activities. During speaking, the mouth is moderately opened, pressures of different magnitude and direction are generated, and forces are produced with a greater horizontal than vertical component acting on the dentures. Furthermore, although speaking causes upward movements of the floor of the mouth similar to swallowing, these movements are not as constant as those found in swallowing. Many studies have analyzed that neutral zone dentures are functionally more stable than conventional dentures.

CASE REPORT

Here in this case report the management of a mandibular resorbed ridge with neutral zone technique using low fusing compound has been described.

A male patient aged 65 years presented to the department of prosthodontics for the provision of complete denture. He had been edentulous since 6 yrs. He was a denture wearer and was willing for a new set of denture due to the reduced retention. On examination it was diagnosed that the maxillary residual ridge was favourable, but the mandibular residual ridge was unfavorable due to resorption.(fig1) Then it was decided to provide lower complete denture, utilizing Neutral zone impression technique.

Clinical visit 1

At the first visit, primary impression of the maxillary edentulous residual ridge was made with modelling plastic compound impression material and mandibular edentulous ridge was made with alginate.(Fig.2) Soon after making primary impression, the impression was poured in plaster of paris and primary casts were prepared. The custom trays were fabricated with self cure resin over the primary casts keeping the borders 2mm short of the sulcus.

Clinical visit 2

The borders of the trays were molded with green stick impression compound and the secondary impressions were made with zinc oxide eugenol impression material. The master casts were poured in dental stone plaster. The record bases were fabricated, assessed and modified for stability, extension and comfort. Wax rims were made over the record bases for recording the jaw relations.

Clinical visit 3

During this visit centric jaw relation was recorded. The mandibular rim was completely removed and an acrylic shim (Fig3) was adapted over the record base in accordance with the recorded vertical height of jaw relation.

Clinical visit 4

The maxillary record base with wax occlusion rim and mandibular record base with acrylic shim were evaluated intra-
orally for their fit. The maxillary rim was left in mouth in order to provide enough support to the facial musculature during making neutral zone impression. Then the softened impression compound and green stick in the ratio of 3:7 was mixed and loaded over the acrylic shims on buccal and lingual aspects (Fig 4) and inserted in mouth and patient was asked to perform movements, which included talking, swallowing, drinking some water, whistling, pursing the lips, pronouncing the vowels, etc. After 5–10 min, the set impression was removed from the mouth and examined.

The putty index was then made for the lower compound rims to recover the occlusal rims in wax.

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 its casts without covering the occlusal surface. (Fig 5)

After 10 min, the set impression material was carefully removed from the compound rims. The buccal and lingual portions were removed as two separate pieces. The shape of the dentures was now permanently registered in these putty indices.

The impression compound was removed and the acrylic shim was reduced down to the bare acrylic resin. The red baseplate wax was melted and poured into the index through the space between the labial and lingual indices on the occlusal surface. When the index was opened, a hard wax duplicate of the low fusing compound had formed. Thus, lower wax occlusal rims were formed. (Fig 6)

The index would have preserved the space of the neutral zone. Teeth arrangement was done exactly following the index. (Fig 7) The position of the teeth was checked by placing the index together around the wax try-in.

Clinical visit 5

Once the waxed up trial dentures were ready, they were checked in the patient's mouth for aesthetics, phonetics and occlusion.

Later on, wax was removed from the labial and the lingual surfaces of the trial dentures leaving only minimal wax which could support the teeth that were placed. Patient was trained for making physiological movements such as tongue, cheek and lip movements. Once the patient was trained regarding the functional movements PVS light body (Aquasil Ultra LV Fast Set; Dentsply Caulk) was placed on the labial as well as lingual surfaces of the trial dentures (Fig 8), it was placed in the mouth and patient was asked to perform movements. This procedure was carried out for the mandibular arches. This recorded the polished surfaces of the denture according to the neutral zone. Once the try-in was 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.

Clinical visit 6

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 as they have been constructed in harmony with their surroundings. (Fig 10). Follow-up of patient was done and the patient reported satisfaction with the prosthesis.

DISCUSSION

The ultimate goal of any prosthodontic treatment is to restore the form, function, and esthetics of the patient. Fish pointed that out of the three surfaces of the denture the polished surface is bounded by the tongue and the cheeks. These are involved in normal physiologic movements such as speech, mastication, swallowing, smiling, and laughing. Hence, the fabrication of the denture must be in harmony with these functions. Because physiologically unacceptable denture is responsible for poor prosthesis stability and retention, insufficient facial tissue support, less tongue space and compromised phonetics. Denture fabricated over a severely resorbed mandibular ridge by neutral zone impression technique will insure that the muscular forces aid in the retention and stabilization of the denture rather than dislodging the denture during function. Whatever materials are used, it seems that two factors cannot be overlooked:

The impression of the neutral zone must be recorded at the occluso-vertical dimension determined at a previous visit using an occlusal rim.

The material should be reasonably slow setting to permit the oral musculature to shape it to the appropriate contour and dimensions.

CONCLUSION

Neutral zone technique is one of the best alternative techniques in case of highly atrophied mandibular residual ridge, but it is rarely used because of the extra clinical step involved and complexity. Complete and partial denture failures are often related to non-compliance with neutral zone factors. Thus the neutral zone must be evaluated as an important factor before one rates any changes in arch form or alignment of teeth.

References


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LIST OF PHOTOGRAPHS

Fig 1. Edentulous maxilla and edentulous mandible

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Fig 3. Denture base with acrylic shim

Fig 4. Establishing the neutral zone

Fig 5. Making tongue, lip and cheek matrices using silicone putty

Fig 6. Mandibular wax occlusal rims

Fig 7. Select and arrange teeth in accordance to putty index

Fig 8. Obtaining impression of the polished surface and establishing their contours in wax-up.

Fig 9. Processing the dentures

Fig 10. Post operative view of patient