Case Report

Rehabilitation of a Patient with Severely Resorbed Mandibular Residual Ridge Utilizing Neutral Zone Technique - A Case Report

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ABSTRACT

Providing complete denture therapy to patients with severely resorbed mandibular residual ridge is challenging as these patients have decreased denture foundation leading to compromised retention, stability, support and comfort. Neutral zone impression technique can be considered as a treatment approach for these types of patients, where dental implants are contraindicated or unfeasible. Neutral zone is the potential space where forces exerted by lips and cheeks on one side are neutralized by tongue from the other side. This technique serves as a guide to arrange teeth and contour the polished surface of the denture to ensure optimal stability, retention, facial support and aesthetics. This is a case report of rehabilitation of patient with resorbed residual mandibular ridge utilizing neutral zone impression technique.

Key words: complete denture, neutral zone, residual ridge, severely resorbed.

INTRODUCTION

Complete dentures are primarily mechanical devices but since they function in oral cavity, they must be fashioned so that they are in harmony with the normal neuromuscular function.[1] Neutral zone is defined as that area or position where the forces between the tongue and cheeks or lips are equal. [2] We should not be dogmatic and insist that teeth be placed over the crest of ridge, buccal or lingual to the ridge. Rather teeth should be placed as dictated by the musculature, and this will vary for different patients.[3] The aim of neutral zone impression is to construct a denture in muscle balance. If the denture is out of harmony with the neutral zone, it will result in instability, interference with function or some degree of discomfort. This technique is most effective for patients who have had unstable, unretentive lower complete dentures. These patients usually have highly atropic mandible and there will be difficulty in positioning the teeth to produce a stable denture.[4]

The purpose of this case report is to present the use of the neutral zone technique for the fabrication of successful and stable maxillary and mandibular complete denture with severely resorbed ridges.

CASE REPORT

A 68 year old male patient reported to the department of Prosthodontics NAMS with chief complaint of unstable mandibular denture. He had been edentulous since 10 years. On intraoral examination, it was revealed that the mandibular residual ridge was unfavorable due to severe resorption. It was decided to provide him with new set of complete denture utilizing neutral zone impression technique.

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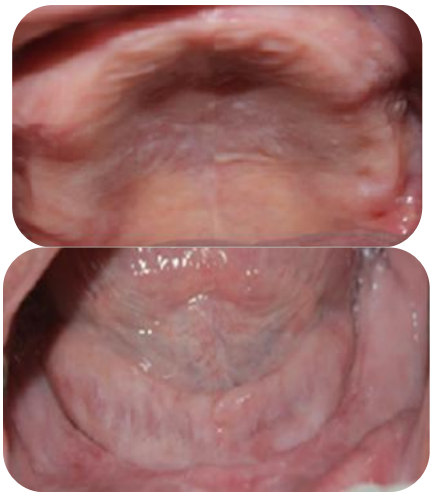

Fig 1: Upper and lower Residual Ridge

PROCEDURE

1. Primary and Secondary Impressions
   Maxillary and Mandibular primary impressions were made in stock trays using Impression compound (DPI Pinnacle, the Bombay Burmah Trading Corporation, Mumbai). Custom trays were fabricated in autopolymerizing resin (Rapid Repair Powder; Dentsply India, Gurgaon) and final impression was made with zinc oxide eugenol impression paste (DPI Impression Paste, the Bombay Burmah Trading Corporation, Mumbai) after border molding with green stick compound (DPI Pinnacle, the Bombay Burmah Trading Corporation, Mumbai). Jaw relation record was made using conventional method.

Fig 2: Upper and lower final impression and Master cast

2. Lower base plate construction
   Auto polymerizing resin mandibular denture base was fabricated with two vertical pillars with respect to premolar region. These vertical pillars had two functions: to provide even occlusal stops at the correct occlusal vertical dimension (OVD) and to provide support for the neutral zone impression material. This denture base was placed in the mouth, checked for stability and ensured that the vertical pillars did not interfere with muscle movements during function.

Fig 3: Denture base with Vertical Pillar

The neutral zone impression material was made with the 2 parts of impression compound and 1 part of green stick compound. These materials were kneaded thoroughly and adapted to the record base, forming a recording rim.

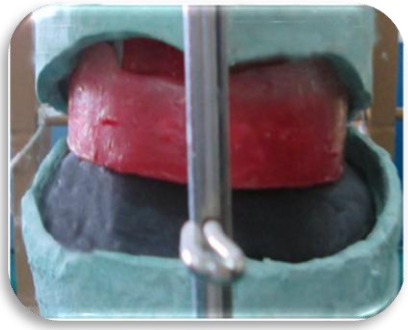

Fig 4: Denture base with neutral zone impression material maintaining OVD

3. The completed record base and recording rims were placed in a water bath for approximately 2 minutes to prepare for the clinical procedure. Maxillary record base was not used during the clinical registration of the mandibular neutral zone to avoid compressive interferences if occlusal contacts were encountered during this functional recording procedure. The base and rim were removed from

the water bath and quickly placed in to the patient's mouth and the patient was instructed to sip and swallow water. This exercise was repeated for several times. The neutral zone record was removed and inspected for accuracy and completeness once it cooled and hardened.

Fig 5: Neutral zone impression labial view

4. For development of the lingual and facial neutral zone index, the neutral zone record was seated in the mandibular definitive cast. Laboratory index was prepared around the neutral zone record using dental plaster type II (Kaldent, Kalabhi Karson, India).Then the neutral zone record rim was removed from the denture base and the index was replaced. Modelling wax was then poured into the space generating exact representation of the neutral zone. This newly formed wax rim was replaced on the articulator.

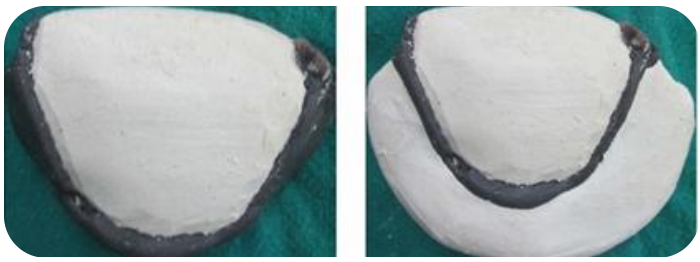

Fig 6: Plaster Index made around Neutral Zone Record

Fig 7: Neutral zone impression material removed and replaced with wax

5. Teeth arrangement was done exactly following the indices. Maxillary anterior teeth and first premolars were arranged in the conventional method. The mandibular anterior teeth were arranged on a new record base so that desired relationship was established with the maxillary anterior teeth and the mandibular teeth fall within the neutral zone as dictated by the facial and lingual indices. The mandibular posterior teeth were arranged so that they contacted the lingual index and also these teeth were made to contact the desired occlusal plane template. Tooth arrangement was completed by positioning maxillary teeth in conventional method.

Fig 8: Teeth arrangement according to index representing neutral zone

6. For the preparation of an external impressions to define the polished surfaces contours of the denture within the neutral zone. Next , base plate wax apical to denture teeth on the facial and lingual aspects of the mandibular trial denture and the facial and palatal aspects of the maxillary trial denture was carefully removed.

   After application of tray adhesive (Caulk Tray Adhesive; Dentsply Caulk, Milford, Del), polyviny silixone impression material (Dentsply Aquasil Ultra Deca 380 Monophase) was applied on the facial aspects of the maxillary trial denture. The trial denture was placed intra orally and the patient was instructed to pucker the lips forward, smile broadly, open the mouth, and move the mandible from side to side. The patient was requested to repeat these movements several times .Once the impression material had set; the trial denture was removed and evaluated. Excess impression materials were trimmed from the trial denture.

Fig 9: Maxillary facial external impression

7. Similarly, tray adhesive and low viscosity VPS was applied onto the palatal aspects of the maxillary trial denture. The trial denture was placed in the mouth and the patient was instructed to sip water, swallow and pronounce sibilant phonetics. This procedure was repeated several times and the impression was evaluated.
8. Next, the impression of facial aspects of the mandibular arch was made. The patient was instructed to pucker the lips forward, smile broadly, move the mandible into protrusive posture, and then move the mandible from side to side .These movements were repeated several times. The trial denture was removed and evaluated.

Fig 10: Mandibular facial and lingual external impression

9. Finally, the external impression was made along the mandibular lingual flanges. The trial denture was placed in the patient's mouth and the patient was instructed to sip water and swallow several times, extend the tongue and move it from side to side and finally lick the upper and lower lips. The patient was asked to repeat these movements until the impression material had polymerized.
10. Laboratory procedures were carried out following conventional methods. Care was taken not to alter the contours generated by the neutral zone impression technique.
11. Denture insertion was done and evaluated for stability, esthetics and occlusion. Results were found satisfactory and patient was also satisfied with the dentures.

Fig 11: Finished denture in patient's mouth

Discussion

Providing stable mandibular dentures for patients with severely resorbed mandibular ridges is a challenging task. One can overcome this problem if dentures are fabricated with their contours harmonizing with the neutral zone. The aim of this neutral zone impression technique is to construct a denture in balance with muscular forces to provide optimum stability, retention and comfort. Various materials have been recommended by different authors for recording neutral zone. Kursoglu[5], Beresin and Schiesser[3] recommended tissue conditioners for recording neutral zone. Since a tissue conditioner does not have sufficient body, one finds it difficult to use. Impression plaster advocated by Johnson [6] is messy and awkward to use. Beresin and Schiesser[3] used impression compound for recording neutral zone, as it is a thermoplastic material , easy to manipulate, has the advantage of low cost and ease of availability. In this present technique two vertical pillars in the premolar region were fabricated on denture base on the articulated casts opposing maxillary rim at a determined vertical height. We used the mixture of impression compound and greenstick compound as neutral zone impression material as suggested by Beresin and Schiesser[3]. Once the neutral zone was recorded, its position preserved with the help of indexing material. Various indexing materials are suggested like plaster, silicone, stone or modeling plastic impression compound[8]. Plaster was the material of choice for our case because of its ease of use, low cost & availability. Teeth arrangement was carried out in the position determined by neutral zone index. In order to work in harmony with adjacent musculature polished surface of denture base must also be determined by neutral zone. For recording external impression, polyvinyl siloxane impression material is material of choice as it has sufficient body, good flow, & easy to use. Finally, the denture was fabricated in

conventional method preserving the contours generated by external impression.

CONCLUSION

Neutral zone impression technique is one of the best alternative techniques in case of highly atrophied mandibular residual ridge, but seldom used because of extra clinical steps involved. The neutral zone philosophy is based on 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 at the same time where the forces generated by the tongue are neutralized by the forces generated by the lips and cheeks. Complete and partial denture failures are often related to inconsideration of the neutral zone factors. Thus the neutral zone must be considered as an important factor for the rehabilitation of patient with severely resorbed ridges.

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