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# PROSTHODONTIC REHABILITATION OF AN ATROPHIED MANDIBULAR RIDGE : A NEUTROCENTRIC APPROACH – A CASE REPORT

[1] Rajani Dable [1] Professor and Head

[1] Department of Prosthodontics, S.M.B.T. Dental College and Hospital,Sangamner, Maharashtra, INDIA,

**ABSTRACT:**

The fabrication of the mandibular complete denture on a severely atrophied ridge is a great challenge for a prosthodontist. The neutral zone technique has been proved to be the only remedial measure to help such patients, with severe resorption, for whom no other options of treatment modalities are feasible. The description of the following case is an illustration of prosthodontic management by using neutral zone technique to acquire the desired results. Treating these patients, under totally unfavorable conditions, is a confrontation to one's abilities. A skillful approach enables the patient to understand and accept the best that is being offered to him/her.

**KEYWORDS: Neutral zone approach, Reinforcement, palatal rugae**

## INTRODUCTION

The management of severely atrophied mandible by a complete denture therapy is demanding as these patients have continuous bone resorption owing to physiologic loss. Various treatment modalities are available to restore the mandibular resorbed ridge.

The most common approaches are as follows:

- Adequate extension of the denture base upto the physiologic limits using most of the supporting tissues.
- Surgical remolding of the bone through vestibular extension procedures to increase vestibular depth and the bone augmentation procedures to improve the foundation.
- Use of various implants to support the dentures.
- However, the ultimate objective is to restore the lost masticatory function.

The geriatric population with grave physiologic loss commonly has multiple nutritional deficiencies and many other systemic problems. This makes the aged unsuitable for dental implants and surgical augmentation procedures. It is better to regard and rehabilitate such patients conventionally, respecting the structures available to take support from. In the absence of any favorable 'support-structure', dentures made in coordination with the neuromuscular system helps to achieve promising results in terms of denture stability and patient comfort.

Beresin and Schiesser have suggested that the denture teeth should be arranged in the neutral zone, where during function the forces of the tongue pressing outward are neutralized by the forces of cheek and lips pressing inward[1].

Ridge resorption is a misnomer as resorption is a part of the process leading to bone loss, whereas atrophy implies a passive process. Therefore, the term remodeling is used to describe the physiological process of bone loss. It has been clinically observed that the functioning complete dentures exert physiologically intolerable forces thus causing excessive alveolar bone resorption. The inherent denture factors including the tooth form and the occlusal pattern, may affect functioning of the supporting structures[2].Therefore it is mandatory to fabricate the dentures in such a way that, they can function in accordance with the muscle movements.

Prosthodontic approach, through ''neutral zone'' technique, in relation to neuromuscular balance, is the only source of stability and support in severely resorbed cases.

The neutral zone is the potential space between the lips and cheeks on one side and the tongue on the other. It is the area where the forces between the tongue and cheeks or lips are equal. Through this technique a prosthodontist attempts to duplicate the natural function with an artificial substitute[3].

The muscular forces that are directed towards the denture will either help to stabilize them or tend to dislodge them. It has always been the prime concern of the dental profession to equalize both the vertical and the horizontal forces delivered to the dentures. But the importance of the horizontal forces exerted on the polished surfaces of the dentures is overlooked, which needs greater concern as well.

The muscles largely control not only the position of the teeth in space but also the size and their relationship with

the jaws while in repose and in function. These same muscles determine the shape and the position of the artificial replacement in place of the lost natural teeth, both in repose and in function. If the artificial substitute, that is denture here, maintains the same relationship in co-ordination with the muscles, successful functioning can be expected.

## Case report

A 71-year-old female patient approached the Department of Prosthodontics for complete oral rehabilitation. On examination it was found that the mandibular bone atrophy was acute (Fig.1). The Maxilla featured a resorbed ridge and a shallow palatal vault. The patient had a history of wearing dentures for the last eight years. These dentures were "tooth-supported" overdentures (mandibular denture taking support of two anterior teeth and maxillary denture supported by two posterior teeth one on either side). With time, attrition and physiologic bone loss loosened the teeth and they were ultimately extracted.

The patient required a new set of dentures mainly for the function, with equal priority to esthetic beauty. It was surprising to observe that the patient was comfortable wearing the mandibular denture, though it was floating in her mouth. Yet she continued wearing it, so that at least some of her teeth would be visible while conversing with people. Such eagerness underlines the urge for esthetics even in elderly patients. Moreover, the patient had conveniently discontinued wearing her upper denture for the last two years because she was unable to manage two ill-fitting dentures at a time.

An early history of the surgical removal of a benign tumor on the right side of the patient's mandible added to the restrictions of load application. The patient's OPG was made to confirm the availability of bone and to ensure any existence or recurrence of pathology (Fig.2).

Adhering to the patient's functional and esthetic demands, in spite of the deficient and denuded biological structures, a treatment plan was chalked up and sectioned into 3 parts.

1. Neutral zone technique for making occlusal rims and impressions;
2. Reinforcement of mandibular denture ; and
3. Duplication of palatal rugae (catering to patient's demand for natural feel).

## Neutral zone approach

Primary impressions of the upper and lower jaws were taken in irreversible hydrocolloid impression material to get a clear idea about the peripheries of the residual ridges and thereafter to construct custom trays in which the final impressions could be made. Final impressions were then made in elastomeric impression material, by molding the borders in putty and the wash impression was made in light body material (Fig.3). The master cast was retrieved out of this and a special tray was fabricated as a plate of autopolymerising acrylic resin. It was adapted to the mandibular ridge, without a handle and wire projections were embedded in the tray to help the retention of the impression material. (Fig.4 and 5).

A green modeling plastic impression compound (Impression Compound; Kerr Corp) was used to record the neutral zone recording rim. It was softened in a water bath at a temperature of 140°F. The material was kneaded thoroughly, rolled and placed over the lower acrylic plate. The compound was adapted well against the borders of the plate and placed in the patient's mouth without the maxillary rim to avoid unnecessary occlusal contacting. Intermittent swallowing movements by the patient helped the impression compound to get molded in accordance with the muscle movements[4]. To keep the material warm the patient was asked to sip some warm water during the movements. The sip and swallow movements enabled to record the accurate impression, thus following the neutral zone and forming a compound rim (Fig.6).

After the completion of the rim recording procedure, a tentative jaw relation was taken using the conventional method. An index was developed with laboratory putty material (ivoclar vivadent) on both the lingual and the facial aspects to register the lingual and facial contours and the occlusal plane (Fig.7a).

Grooves and notches were marked on the compound rims for the easy orientation of the indices. An Occlusal template was used to check the incisal and occlusal level at the time of teeth-setting. Once the material had set, the indices were separated (Fig.7b)

The compound rim was removed and was replaced by modeling wax. The teeth were arranged and set in relation with the indices (Fig.8).

External impressions were made to confirm the polished surface contours and confines. The wax apical to the denture teeth was removed from the facial, lingual and palatal surfaces of both the dentures. Vinyl polysiloxane, a low viscosity impression material was used for the purpose.

The patient was instructed to perform movements such as, side movements of the jaw, broad smiling, and puckering the mouth (Fig.9 a, b, and c). The impressions were carefully removed from the mouth and the excess material was cleared off from the teeth (Fig,10 a, b). It was then followed with all the conventional laboratory procedures[5].

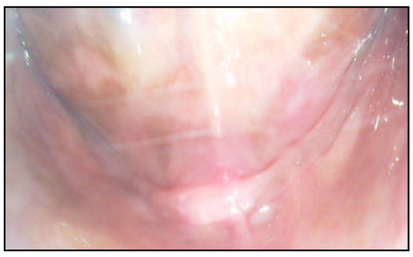

Fig.1. Atrophic mandibular ridge

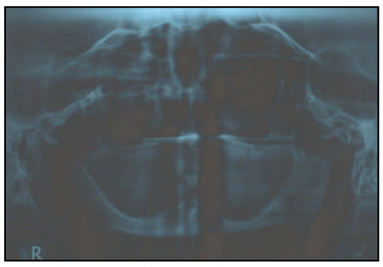

Fig.2. Orthopantomograph

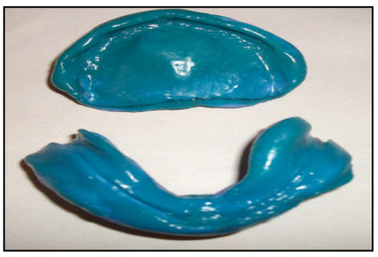

Fig.3. wash impression in light body material

Fig.4. Master cast

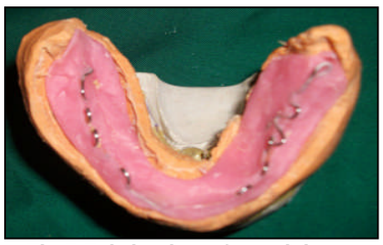

Fig.5 Fabrication of special tray

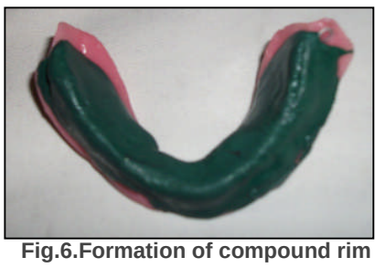

Fig.6.Formation of compound rim

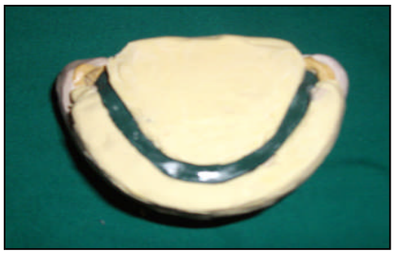

Fig.7A.Index preparation

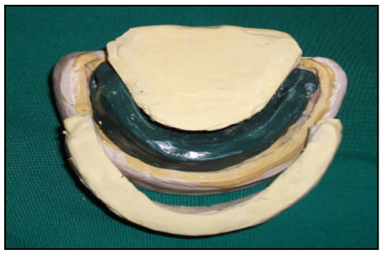

Fig.7B.Occlusal Template

Fig.8. Teeth setting as per neutral zone

Fig.9A

Fig.9B

Fig.9C

Fig.9. External impression simulating the muscular movements

A



B

**Fig. 10. A and B. Maxillary and mandibular 'External impressions'.**

**Reinforcement of the mandibular denture** The prosthesis was reinforced in a manner without increasing its weight. A thin but rigid metal meshwork was incorporated by adapting it to the master cast before packing the heat cure acrylic resin material (Fig.11 and 12).

**Duplication of palatal rugae** The patient, being accustomed to rest her tongue against the palatal rugae due to discontinuation of denture wearing, wanted her new denture to be prepared with the same feel.

**Fig11. Adaptation of metal framework**

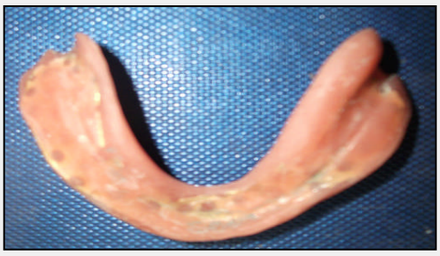

**Fig.12.Processed lower denture**

## Technique

A low-density polyethylene plastic sheet was molded to the master cast, by vacuum or pressure thermoforming technique, duplicating the rugae onto the maxillary cast. The sheet was so cut in order to get it adapted on the temporary record base, fixing it in position to the waxed up denture. This was followed by flasking the denture which ultimately provided its index in plaster. Eventually the plastic sheet was removed after the dewaxing and the rugae were transferred to the final denture.

Both the dentures were polished and finished after checking the occlusion and delivered to the patient (Fig.13).

**Fig13. Denture delivery**

## Discussion

The neutral zone concept follows the rules of neuromuscular activity in relation with the teeth. The teeth erupt in the mouth under the influence of muscular environment. The resorption of alveolar bone takes place in different phases, and due to its varying resorption pattern, it is difficult to ascertain the exactness of the tooth position. Studies have shown that the teeth placed closer towards/to the ridge have additional lever balance. The crest of the alveolar ridge can be used as the biometric guide for the placement of teeth but its position changes with respect to resorption. However it does not help in determining the tooth positions.

The function of the neutral zone is to locate the area occupied by the natural dentition before the extraction of the teeth. It allows the artificial substitutes to set in natural position, and the forces exerted by the muscles stabilize the denture rather than unseat it.

This technique is based on the principle of the correct positioning of the teeth. The polished external surfaces of the dentures should be so contoured that the horizontally directed forces applied by the peri-denture muscles will act to hold the denture in place.

The philosophy of neutral zone technique defines the concept of denture stability within the confines of

neuromuscular extent. It simply delineates that the artificial teeth should not be placed on the crest of the ridge or the buccal or lingual to it. It should rather be placed as dictated by the musculature. The "neutral zone" technique is an important procedure that facilitates the clinician to determine the mandibular anterior and posterior denture tooth positions. As against the recommendations of the many schools of thought regarding the placement of occlusal plane, it is advisable to re-position the denture teeth in place of the lost natural teeth[6].

Patients, who have deficient bone support due to acquired problems such as, maxillofacial surgery or congenital clefts / defects either in maxilla or mandible, confront a critical situation as any conventional treatment modality is unable to serve them the best, except the one which functions in accordance with the remaining existing muscular activity. The neutral zone technique can definitely serve the purpose by stabilizing the dentures as they function in conformity with the muscle tone[7]. Moreover, in patients with unfavorable bone support, the neutral zone impression technique provides the accurate denture polishing surface contours which adds to the denture stability[8,]

The neutral zone technique may also be used for the implant supported overdentures thereby reducing unwanted movements, and providing a distinct idea about the placement of teeth.

For patients with flabby ridges, fabrication of complete dentures is a challenge because stability is near impossible unless treated carefully. The conventional impression techniques may destabilize the dentures as the flabby tissues rebound and consequently dislodge the dentures. Neutral zone technique provides relief to such patients as well [10, 11.]

**CONCLUSION**

In spite of the availability of various treatment modalities for management of atrophied mandible, there are many contraindications for each of them. Extreme care need to be taken in the case of compromised geriatric patients, for there are possibilities of inviting graver issues while treating the existing one. The adoption of the best treatment modality for a particular patient depends on his/her biological, physical and most importantly, psychological status. In the case mentioned above, all these factors were taken into consideration leading to successful prosthodontic management.

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**Corresponding Author**


**Dr. Rajani Dable**, M.D.S.,
Professor & Head of the Department,
Department of Prosthodontics,
S.M.B.T. Dental College & Hospital,
Sangamner, Maharashtra, INDIA,
Email: rajnidable@hotmail.com
Mobile:09004949313