Rehabilitation of severely atrophied mandibular ridge with neutral zone technique

A Case Report

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Abstract: One of the most commonly faced problems among long term denture wearers is the reduction in the denture foundation. Prosthetic rehabilitation of a patient with severely resorbed ridge is the most challenging therapy a Prosthodontics can undertake. The neutral zone technique provides muscular harmony over the denture stability. The main aim of the neutral zone technique is to construct denture in muscle harmony, so that it does not get displaced during the actions of the muscles affecting swallowing, mastication, speech and so on.

Key words: Neutral zone, Atrophic mandible.

INTRODUCTION

The co-ordination of complete dentures with the neuromuscular function is the foundation of successful, stable dentures (Boere et al, 1990). The success of the prosthesis may be adversely affected by incorrect tooth placement and arbitrary shaping of the polished surfaces. This is particularly true for patients with reduced mandibular residual ridges, yielding flat or concave foundations due to severe bone resorption (Davidson & Boere, 1990). It 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 cheeks lips are equal.

The aim of the Neutral zone is to construct a denture in muscle balance.

Historically, different terminology has been loosely associated with this concept, including dead zone (1), stable zone (2), zone of minimal conflict (3), zone of equilibrium (4), zone of least interference (5), biometric denture space (6), denture space (7), and potential denture space (8). If the denture is out of harmony with the neutral zone, it will result in instability, interference with function or some degree of discomfort. Thus neutral zone must be evaluated as an important factor before aligning the teeth in complete denture or partial denture. This is the zone where the natural dentition exists. As the mandible atrophies at a greater rate than the maxilla less residual ridge for retention and support, the lower denture commonly presents the most difficulties with pain and looseness being the most common complaints. The neutral zone technique is most effective for patients who have had numerous unstable and nonretentive lower complete dentures. These patients usually have a highly atrophic mandible and there has been difficulty in positioning the teeth to produce a stable denture.

CASE REPORT

A 65 year old male patient was referred to the department of Prosthodontic 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 and chewing efficiency of the denture. On examination it was diagnosed that the maxillary residual ridge was favourable, but the mandibular residual ridge was unfavourable due to resorption. Then it was decided to provide lower complete denture, utilizing neutral zone impression technique. A preliminary impression of the maxillary and mandibular arches was made with impression compound and impressions were poured with dental plaster and the primary casts were retrieved. It was followed by Border molding with low fusing compound and final impression with Zinc oxide Eugenol impression paste. Tentative jaw relation was recorded. For the mandibular arch, a new record base
was fabricated incorporating stainless steel wire spurs in the posterior and anterior region (fig. 1). Then the low-fusing compound was loaded over the wire loops on buccal and lingual aspects and inserted in mouth and patient was asked to perform the usual movements, which included swallowing, sucking of the lips, pronouncing the vowels, which helped in recording the neutral zone space (fig. 2). Putty (polyvinyl siloxane) was used to form an index around the neutral zone (fig.3) or plaster indices (fig.4) were made surrounding the neutral zone impression. ‘V’ shaped indexes were made on the mandibular cast, in order to guide the placement and removal of the plaster. The pink baseplate wax was slowly melted and poured into the index to duplicate the low fusing compound. Teeth arrangement was done and it was rechecked using the plaster index (fig.5). The wax trial dentures were tried intraorally to check the, appearance and occlusion (fig.6). Denture insertion (fig.7) was done.

**DISCUSSION**

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 influence of tooth position and flange contour on denture stability is equal to or greater than that of any other factor. We should not be dogmatic and insist that teeth be placed over the crest of the ridge, buccal or lingual to the ridge. Teeth should be placed as dictated by the musculature, and this will vary for different patients. Positioning artificial teeth in the neutral zone achieves two objectives. First the teeth will not interfere with the normal muscle function and second the forces exerted by the musculature against the dentures are more favourable for stability and retention.

The denture shaped by the Neutral zone technique will ensure that the muscular forces are working more efficiently and in harmony.

Other advantages of neutral zone are:

- Improved retention and stability
- Posterior teeth will be correctly positioned allowing sufficient tongue space.
- Reduced food trapping adjacent to the molar teeth
- Good aesthetics due to facial support.

**Factors affecting the neutral zone:**

The actions of following muscles affect the neutral zone:

- Muscles of cheek:
  - Buccinator
  - Masseter
- Muscles of lips:
  - Orbicularis oris
  - Caninus
- Muscles of tongue

The procedures discussed can also be used for tooth supported overdentures and full mouth rehabilitation of edentulous patients with dental implants. But as rehabilitation using implants requires the patient to be in systemic health along with the cost factor involved, this technique could not be used in this present case.

**CONCLUSION**

At the time of insertion, dentures fabricated with neutral zone technique showed better retention, stability and esthetics. Dentures were again evaluated and it showed increased masticatory efficiency on clinical examination and better patient acceptance after 3 months follow-up. With advancement in dental material science and development of newer techniques in Prosthodontic the neutral zone impression technique may be incorporated into fabrication of any complete denture.

**REFERENCES**


Fig.1. Mandibular record base incorporating stainless steel wire

Fig.2. The moulded low-fusing compound after the functional movements.

Fig.3. Putty (polyvinyl siloxane) index.

Fig.4. Plaster index
Fig. 5. Arrangement of teeth in neutral zone rechecked using plaster index.

Fig. 6. Wax trial dentures.

Fig. 7. The final denture