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From Diagnosis to Delivery: A Comprehensive Case Report on Utilizing The Neutral Zone Concept

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Abstract

Resorption of mandibular ridges is a multifactorial and biomechanical disease that is chronic, progressive, irreversible, and cumulative leading to loss of sulcular depth, vertical dimension loss, and decreased lower facial height. Longterm complete denture patients face problem of instability of their mandibular complete denture due to the high resorption rate of lower edentulous ridge in comparison to maxilla. Prosthetic Rehabilitation of a patient with severely resorbed ridge is the most challenging treatment for a prosthodontist. This article presents the application of neutral zone concept being incorporated in to impression making in an effort to achieve successful complete denture.

Keywords: Oral cavity, Whistling, Resorption rate, Irreversible, Denture retention

Introduction

Complete dentures are a mechanical device that performs a functional activity in the oral cavity, the teeth arrangement and polished surface of denture must be in an appropriate and acceptable manner so that they are in harmony with the all intra oral and extra oral muscular functions, such as talking, eating, whistling, deglutition, smiling, and laughing, involving the interactions

between tongue, lips, cheeks, and floor of the mouth. With the increase in resorption rate, the influence of impression surface on denture retention and stability decreases [3]. The unstable mandibular complete denture is a challenging scenario for a prosthodontist.

Residual ridge resorption (RRR) is a chronic, progressive, irreversible, and disabling disease, probably of multifactorial origin. RRR is an inevitable and natural physiologic process. Stability and retention become more dependent on correct position of teeth and the contours of external or polished surface of the dentures [3]. Therefore, these surfaces should be so contoured that horizontally directed forces applied by perioral muscles should act to seat the denture.

Fish picked up one out of other three surfaces of the denture that is polished surface which is bounded by the tongue and the cheeks. In 1931 Wilfred Fish of England introduced neutral zone concept. What is neutral zone? It is the potential space between the lips and cheeks on one side and the tongue on other, that area where forces between the tongue and cheeks or lips are equal. Neutral zone technique is most effective way for patients who have unstable and unretentive dentures. The neutral zone technique is favourable for patients with multitudinous, unstable, unretentive mandibular complete dentures [5].

Case Presentation

A 72-year-old man reported to the Department of Prosthodontics, ST. Gregorios dental college, Kothamangalam, Kerala, with the chief complaint of an unstable loose mandibular denture with attrited teeth. Also gives the history of wearing complete denture for 10 years. On intra oral examination, it was observed that completely edentulous maxillary and mandibular arches, with V shaped mandibular ridge. Due to excess resorption of alveolar ridge muscle attachments were close to the residual ridge i.e. Labial, buccal and lingual frenum with Class III attachment.

Clinical Procedure

Impression making

The primary impressions were made using alginate impression for both maxillary and mandibular arch in stock trays. The impressions were poured using Type II gypsum to obtain diagnostic casts. Custom trays were fabricated. Border moulding of both maxillary and mandibular arches was done using low fusing impression material and final wash impression was made in low viscosity mucostatic zinc oxide eugenol impression material. Impression was poured in Type III dental stone to obtain master casts (Figure 1).

Figure 1:

In next appointment the mandibular border moulding was done and secondary impression was made using zinc oxide eugenol impression material (double secondary). The impression was poured using type III dental stone. Maxillary record base was fabricated using self-cure acrylic resin and the mandibular record base was fabricated using heat cure acrylic resin material (DPI) to increase comfort and stability. On record base, the wax occlusal rims were fabricated, Jaw relation and facebow transfer was done and articulated in a semi adjustable articulator (Figure 3).

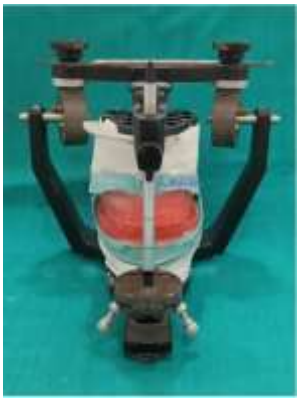

Figure 2:

Wax of Mandibular occlusal rim was completely peeled off and self-cure acrylic pillars were attached over the mandibular record base in relation with recorded vertical height (Figure 3).

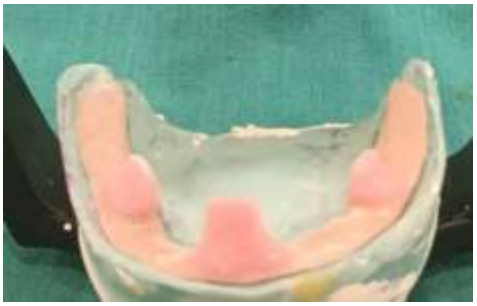

Figure 3:

Maxillary occlusion rim and modified mandibular record base with acrylic pillars were evaluated intra orally for their fit & ensured that acrylic pillars do not interfere with muscle movement during functional movements.

Maxillary rim was retained inside the mouth providing support to the facial muscle during registering of neutral zone. Before starting with the neutral zone procedures, the patient shoulders were made relaxed with the head unsupported. Maxillary wax rim which was left inside the mouth was checked for support & occlusal plane. The Admix material (fusing impression compound and low fusing green stick in ratio 3:7) was softened in a 63 to 65˚ C water bath. The softened compound was properly kneaded and rolled over the attached acrylic pillars on record base at recorded vertical dimension. Next to bring the muscle in action patient was asked to repeat series of actions like whistling, speaking, pursing the lips, swallowing, sucking, sipping water and slightly protruding the tongue out (Figure 4). These actions were performed repeatedly simulating physiological functioning.

Figure 4:

After 5 minutes, the set impression was taken out from the mouth. The neutral zone impression obtained was transferred on the master cast (Figure 5). Locating grooves were cut on the master cast.

Figure 5:

Buccal and lingual indices were fabricated with laboratory putty and the matrices are shaped to the exact height of lower occlusal plane, which was established in the mouth. This preserves the height of lower occlusal rim. While the material sets, cuts were made with BP blade for easy separation of indices (Figure 6). After the putty sets, the compound occlusal rim and acrylic pillars was then replaced by flowing the molten wax in between the index to obtain wax rim in the neutral zone.

Figure 6:

At first, the mandibular teeth arrangement was done in the neutral zone area, then maxillary teeth were arranged according to the mandibular teeth position. Position of the teeth was checked by placing the putty index around the mandibular teeth arrangement. (Figure 7).

Figure 7:

During the wax trial the denture stability was checked by repeating all the movements done for recording the neutral zone. Aesthetics, phonetics and occlusion were assessed. Next, denture fabrication was done in heat cure acrylic resin by conventional method. Finishing and polishing done and denture delivered to the patient.

Figure 8:

Post insertion instructions were given to the patient and recalled after 24 hours for 1st check-up followed by 1 week.

Discussion

In the field of oral rehabilitation, particularly in geriatric patients, many factors contribute to the overall performance of complete dentures. Usually, the mandibular denture is relatively less stable than the maxillary with increasing life expectancy and progressive severe mandibular resorption. One of the philosophies being introduced to overcome the challenge of unstable dentures in clinics is the concept of the neutral zone. Hickey and Zarb stated that the posterior part of the arch form will be determined to a greater extent by the “neutral zone.” [4] Watt suggested that the artificial teeth should be placed in the approximate position occupied by the natural teeth.

Beresin and Schiesser stated that the neutral-zone philosophy is based upon the concept that is 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 leading to retention. 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. This technique simply delineates the concept that artificial teeth should not be placed on the crest or buccal or lingual to it but rather be placed as dictated by musculature by the controlling action of cheeks, lips, and tongue that confine the dentures.

Arranging artificial teeth within the neutral zone achieves 2 important objectives:

I. Prosthetic teeth do not interfere with normal muscle function; and

II. Normal oral and perioral muscle activity imparts force against the complete dentures that serves to stabilize and retain the prostheses rather than cause denture displacement [1][2].

The technique of neutral zone described in this article is simple but technique sensitive to record the physiological dynamics of perioral muscular functions. The material used for recording neutral zone should be reasonably slow setting to allow the oral parafunctional musculature to shape it to the appropriate contour and dimensions. Artificial teeth to be arranged within the neutral zone to achieve two important objectives: No interfere seen between prosthetic teeth and normal muscle Function and perioral muscle activity imparting force against the complete dentures that serves to stabilize and retain the prosthesis rather than causing denture to displace.

Conclusion

New innovations, advance dental materials and development of newer techniques in prosthetic dentistry have proven greater success in stability, support and retention of denture. Recording of the Neutral zone is a simple effective non-invasive and economic way which involves only one extra clinical step and improves the denture stability tremendously. This procedure should be performed for all the complete denture with resorbed ridges patients either solely or in conjugation with other procedures to improve the denture stability, and also should be incorporated into fabrication of every complete denture.

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