

Boon to Edentulous Mandible – A Neutral Zone Technique in Complete Denture: A Case Report

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ABSTRACT

INTRODUCTION

In case of complete edentulism there is a cavity in the oral cavity that can be called a potential denture space. The prosthesis space is bordered by the tongue inside and outside by the lips and cheek muscles and tissue. In the prosthesis space, there is an area called a neutral zone. The neutral zone is an area in the mouth where the tongue's outward force against the cheeks and lips inner force during the tongue function. These forces are generated by muscle contraction during various functions such as chewing, swallowing, and speaking, so they vary in magnitude and direction during different stages of an individual's life. The way it is oriented either helps stabilize the prosthesis or tends to displace it.

CASE REPORT

A 66-year-old man reported to the department of prosthodontics crown and bridge and wanted to have new upper and lower dentures made. Patient was a complete denture wearer for seven years. He complained of fracture of the lower prosthesis. The patient had undergone open-heart surgery 12 years earlier. On intraoral examination, the shape of the upper arch was U with moderate height. However, the lower arch showed severe crest loss combined with the knife-edge shape. The vestibule disappeared and motile tissue extended to the residual crest. A panoramic radiograph showed the mandible with severe alveolar ridge resorption. Radiographic findings showed a minimum vertical height of the mandible of approximately 10–15 mm, defined as type III. A clinical examination showed that only the posterior vestibule of the tongue remained. Therefore, the classification of muscle attachment is type D.

CONCLUSION

Neutral zone technique increased the retention in the severely resorbed ridge as well as improved the form, function and esthetic.

Keywords: Denture space, Stability, Neutral zone.

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I. INTRODUCTION

Full denture stability is influenced by the surrounding neuromuscular system in the oral cavity. Oral functions such as speaking, chewing, swallowing and laughing involve a highly complex and highly individual synergy of the tongue, lips, cheeks and floor of the mouth. Neuromuscular control is important for denture stability.¹

Increased ridge resorption, especially in the mandible, reduces denture stability. Implant overdentures can provide long-term prognosis and more stable outcomes. However, for some medically challenged and financially constrained patients, this treatment may not be a better choice than conventional dentures.²

Therefore, techniques to improve retention and stability should be considered in the presence of severe alveolar ridges to create prostheses that match the forces exerted by the tongue, lips, cheeks, and floor of the mouth.³ The goal of the Neutral Zone Technique is to build a balanced denture with a physiologically optimal denture contour and a physiologically appropriate denture shape.⁴ This technique was first described by Wilfred Fish in 1931, who reported on the effect of polished surfaces on denture retention and stability. These tissues exert elastic pressure on the prosthesis, both when it is functioning and when it is at rest, holding it in place rather than displacing it.⁵

II. CASE REPORT

A 66-year-old man came to the department of prosthodontics and asked to have new upper and lower dentures made. He wore prostheses for seven years. He complained of a fracture of the lower prosthesis. The patient had undergone open-heart surgery 12 years back. On intral oral examination upper arch was U shape with moderate height. However, the lower arch showed severe crest loss combined with the knife-edge shape. (Figure 1 and Figure 2) The vestibule disappeared and motile tissue extended to the residual crest. A panoramic radiograph showed the mandible with severe alveolar ridge resorption. A clinical examination showed that only the posterior vestibule of the tongue remained. Therefore, the muscle attachment classification is type D. The patient was advised for a complete denture using the Neutral Zone Technique in lower denture. Clinical procedures was explained to the patient and informed consent was taken.

CLINICAL PROCEDURES

APPOINTMENT 1

Using irreversible hydrocolloid impression medium,(Zhermack Dust-free Thixotropic Tropicalgin,Italy) preliminary impression of the mandibular and maxillary edentulous residual ridges was taken (Figure 3)after which diagnostic casts were made using dental plaster (Bombay Burmah Trade Corporation, Ltd., Mumbai, India) (Figure 4) on which custom tray was fabricated using cold cure resin (Bombay Burmah Trading Corporation, Ltd., Mumbai, India). Border moulding was carried out using green stick compound, (The Bombay Burmah Trading Corporation, Ltd., Mumbai, India).(Figure 5) After which secondary impression was made using monophasic elastomeric impression material.(The Bombay Burmah Trading Corporation, Ltd., Mumbai, India) (Figure 6)

APPOINTMENT 2

The maxillary occlusal rim was placed and parallelism was verified using the Fox occlusal plane. The mandibular record base was also placed to check extension and stability by guiding the patient to perform mandibular movements. Once the mandibular record base was stabilized, the vertical jaw relation was determined with the help of metal wire placed in the form of U shaped loops placed on the mandibular denture.(Figure 7) The vertical dimension at rest (VDR) was evaluated 8 mm. Vertical dimension at occlusion (VDO) was determined with the help of wire loop fabricated on the mandibular record base. The patient was instructed to bite on the wire loops as it reached the early dough stage along with the maxillary occlusal rim. (Figure 8).The established VDO was 7.8 mm. The horizontal jaw relation was recorded using the admix material in which patient was instructed to perform mandibular movements such as swallowing, sucking of the lips, and pronouncing the vowels, which helps in moulding the neutral zone space. (Figure 9)

Three notches were made on the cast one anteriorly and two posteriorly followed by application of separating medium on the cast, the record base, and over the neutral zone record. Boxing was done with modeling wax (Figure 10) and plaster of Paris was poured into the boxing up to the upper surface. The plaster indices were sectioned into a labial and buccal index and a lingual index in order to guide the removal and placement of these indices. (Figure 11) Wax was poured in the space representing the neutral zone, forming the new occlusal rim on the mandibular record base. (Figure 12) The mandibular teeth were arranged following the index, and the maxillary teeth were arranged following the mandibular teeth arrangement. (Figure 13)

APPOINTMENT 3

A wax try-in was done to evaluate mandibular record base stability, aesthetics, and occlusion. (Figure 14) After which dentures were processed with heat-cure acrylic resin(DPI RR, Medikabazaar , India) and then trimmed, finished and polished.

APPOINTMENT 4

Denture insertion was done. (Figure 15) Recall visits were given to verify retention, comfort, and function.

III. DISCUSSION

Since it has been explained, the neutral zone concept's basic principles have not changed. The neutral zone impression technique has undergone a number of alterations, including changes to the functional motions carried out and the initial record as well as adjustments to the impression materials used and the design of the recording platform. There are several distinct neutral zone impression techniques that have been proposed. For instance: (1) The neutral zone impression is formed using impression compound as the occlusal rim to record the neutral zone contour before the final impression is finished, without inserting the upper recording base. (2) The neutral zone is recorded with a specific recording base and maxillary wax rim at the chosen vertical dimension after the master impression and VDO determination. (3) Relining the polished surface of the delivered denture using the functional impression procedures or refining the polished surface of the trial wax denture with the impression material.⁶ Depending on the clinician's preferences, any or all of the methods may be used. When compared to the neutral zone recorded using the swallowing approach, the neutral zone recorded using the phonetic technique is substantially smaller.⁷ Clinical dentures made by shaping the neutral zone with one functional movement may become unstable when performing other activities.⁸ In order to shape the lingual aspect of the impression initially, the patient was asked to open her mouth, move her tongue, and lick her lips. After that, he was instructed to smile, suck, and swallow.⁹ Nonetheless, they are impacted by a number of factors, including varied impression materials, functional movements, procedures, vertical dimensions, muscle tones, the edentulism phase, and uncontrolled transitional tooth extraction.¹⁰ The results may have been slightly different when the polished surface form and the tooth position in the processed denture were reevaluated in this case because there may have been statistically significant differences in the width and shape of the recorded neutral zones among the various materials and methods.¹¹ The neutral zone technique for fabricating dentures benefits from the surrounding soft tissues' ability to stabilize rather than be moved by it.¹² Denture stability and retention are increased, particularly in the severely atrophic ridges. One drawback to this procedure is the increased laboratory and clinical step with increased cost and time.¹³

IV. CONCLUSION

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 dislodge the denture and will get neutralized by the outward and inward forces exerted by tongue and cheeks. Regardless of the method of treatment, any part of the dentition out of harmony with the neutral zone will result in instability, interference with function or some degree of Thus, the neutral zone must be considered as an important factor while rehabilitating the edentulous patients. The operator should try to neutralize forces acting on complete dentures, which will make the prostheses more functionally physiologically and psychologically acceptable to the patient.

CONFLICT OF INTEREST

NIL

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Figure 1: Intra oral view of maxilla



Figure 2 : Intra oral view of mandible



Figure 3: Diagnostic impression of maxilla and mandible



Figure 4: Diagnostic cast of maxilla and mandible



Figure 5 : Border moulding of maxilla and mandible



Figure 6: Secondary impression of maxilla and mandible



Figure 7: Tentative jaw relation



Figure 8: Checking vertical dimension using wire loops



Figure 9: Neutral zone recording with admixed compound



Figure 10: Boxing of the lower cast with neutral zone recording



Figure 11: Plaster indexing with three notches



Figure 12: Pouring of modeling wax for rim fabrication



Figure 13: Teeth arrangement within neutral zone space in mandible



Figure 14: Wax trial



Figure 15: Denture insertion

