The Concept of Neutral Zone and Rehabilitation of Severely Resorbed Alveolar Ridges: A Special Case File

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Abstract

Mandibular dentures often present greater difficulty in achieving retention, stability and support than do maxillary dentures, primarily, due to a complex anatomy because of bone architecture and muscle attachments and consequently, increased number of anatomic limitations. Long-term edentulism as well as prolonged use of ill-fitting dentures result in severe resorption of the alveolar ridges, further, worsening this situation. The present case report describes a similar case of a 90-year-old male patient who reported to the Department of Prosthodontics seeking replacement of his missing teeth. Upon examination, the lower denture was ill-fitting with a severely resorbed mandibular alveolar ridge. Intra-oral examination revealed an Atwood’s class III maxillary edentulous ridge with class VI edentulous mandibular ridge. Special measures were adopted for the management of the patient through a modified impression technique along with physiologic registration of the neutral zone.

Keywords: Neutral zone; Rehabilitation; Severely resorbed mandibular alveolar ridge

Introduction

Mandibular dentures often present greater difficulty in achieving retention, stability and support than do maxillary dentures, primarily, due to a complex anatomy because of bone architecture and muscle attachments and consequently, increased number of anatomic limitations. Long-term edentulism as well as prolonged use of ill-fitting dentures result in severe resorption of the alveolar ridges, further, worsening this situation [1-3]. Prosthodontic management of such compromised alveolar ridges requires specialized techniques starting from the impression procedure itself [4]. Oral functions involve synergistic actions of tongue, lips, cheeks and floor of mouth which are highly specific to an individual. Failure to recognize the importance of tooth position, flange form and contour results in dentures which are unstable, however, skillfully, they are constructed. Due to increased inter-ridge distance in patients with resorbed alveolar ridges, tooth positioning becomes increasingly important in aiding the stability of dentures so that the muscle activity of the attached and surrounding muscles imparts forces to stabilize rather than displace the dentures. The teeth, therefore, should be placed in the neutral zone i.e. the potential space between the lips and cheeks on one side and the tongue on the other while all the lateral forces are made to be in a balanced state [5,6]. Neutral zone is, also, recognized by the terms dead zone, stable zone, zone of minimal conflict, zone of least interference and the zone of equilibrium [7-10]. The present case report describes a clinical case wherein same measures were adopted for the management of a patient who came with severe mandibular ridge resorption through a modified impression technique along with physiologic registration of the neutral zone.

Case Presentation

A 90-year-old male patient reported to the Department of Prosthodontics seeking replacement of his missing teeth. The previous denture was made 10 years back with a history of continuous denture wear. On examination, the lower denture was ill-fitting with a severely resorbed mandibular alveolar ridge. His vital signs were reported to be normal while there was no significant history pertaining to his cardiac, respiratory and metabolic status. There was no history of any kind of prolonged stay in a hospital for medical assistance in the past as well. Intra-oral examination revealed an Atwood’s class III maxillary edentulous ridge with class VI edentulous mandibular ridge [11-14] (Figure 1). No bony spicules or, signs of inflammation were seen anywhere across the maxillary and mandibular alveolar ridges. The Orthopantomograph (OPG) of the patient, though, revealed marked resorption in the mandibular arch. According to Wical and Swoope [15] analysis, this ratio was found to be around 0.1 (Figure 2). A treatment plan was formulated which consisted of...
impressing the severely resorbed mandibular edentulous ridge while using the principle of neutral zone technique. Primary impressions were made using medium fusing impression compound for the maxillary arch and irreversible hydrocolloid for the mandibular arch (Figure 3). Primary casts were poured (Figure 4). Special tray was constructed for the maxillary arch using full spacer with tray material. A modified mandibular custom tray was prepared without any spacer over the primary cast using tray material. After evaluation in the mouth, the custom tray was adjusted 2 mm short of the physiologic depth of the labial and lingual sulci. The crest of the ridge was marked using an indelible pencil and transferred to the tray. A window was cut in the tray corresponding to the crest of the ridge (Figure 5). The tray was, then, seated onto the cast and softened modeling wax was placed into the window and shaped to form a handle. Tray adhesive was applied to the borders and intaglio surface of the custom tray and it was loaded with putty consistency elastomeric impression material. The tray was, then, seated onto the ridge and the labial and lingual borders were molded. The borders of the impression were trimmed by 0.5 mm. The wax handle was removed and the putty material over the window cut-out. Light-body elastomeric impression material was loaded into the tray and seated on the ridge. Additional light-body material was expressed into the window. Lingual and facial borders were, then, molded ensuring the tray remains steady until the impression material sets. Master casts were poured from it (Figure 6). Record bases were made using auto-polymerizing resin and occlusal rims were made in medium fusing impression compound.

**Concept of Neutral Zone and Neutral Zone Recording Technique**

In Neutral zone recording, the softened compound rims were tempered and placed in the patient's mouth and patient was asked to perform various movements like swallowing pursing and sucking the lips so that these compound rims got molded (Figure 7). Jaw relation was made using the same compound rims and transferred to a 3-point articulator (Figure 8). After mounting, the casts were removed preserving the indices on the casts and the articulator. Plaster indices were made on these compound rims to ensure the neutral zone at various steps (Figure 9). Same indices were, then, used to make the wax rims by pouring molten modeling wax automatically confining them to the recorded neutral zone (Figure 10). The wax rims were mounted on the articulator with the help of previous indices with sticky wax (Figure 11). Teeth arrangement was done using semi-anatomic teeth.
and checked with the help of plaster indices (Figure 12). At the try-in appointment, soft tissue recording was done by performing various movements using Zinc Oxide Eugenol (ZOE) paste (Figure 13). Carving was done at the cervical region of each tooth (Figure 14). The dentures were then flasked, packed, processed and verified with the help of indices (Figure 15). Subsequently, finishing and polishing was done (Figure 16) and the dentures were inserted and occlusal prematurities removed (Figure 17).

**Discussion**

To achieve stability and retention in patients with severely resorbed/atrophied maxillary and mandibular residual ridges in patients with prolonged edentulousness is a real challenge well-known to the prosthodontists [1-3]. The said challenge gets even more pronounced in case of severely resorbed mandibular ridges because of a complex anatomy and increased number of anatomic limitations [2,3]. Chandrasekharan et al. [16] modified the impression technique, especially, for the said situations using elastomeric impression materials which were more patient-friendly and convenient for the operator. The heavy body elastomeric impression materials used in the said technique placed pressure on the ridge slopes while the crest of the ridge was impressed with minimal pressure using light-body impression materials. Patients with increased alveolar ridge loss have smaller denture base areas. In such patients, denture stability and retention become even more difficult to be achieved and are actually dependent on the correct positioning of the teeth [17-19] and contours of the external surfaces of the dentures warranting the use of neutral zone technique [20,21]. The said neutral zone was recorded in the present case with the help of Zinc Oxide Eugenol (ZOE) impression paste. Hence, the outcome was with the correct alignment of teeth in the marked neutral zone area while recording the polished surface correctly allowed the tongue, lips, cheeks and floor of the mouth to be in harmony with each other improving the stability of the denture.
and thus, achieving maximum functional efficiency.

Conclusion

Mandibular dentures often present greater difficulty in achieving retention, stability and support than do maxillary dentures, primarily, due to a complex anatomy because of bone architecture and muscle attachments. Recording of the neutral zone allows the prosthodontists to fabricate a denture that is customized to the patient's musculature and therefore, is more stable and with good retention and comfortable to the patient. The present case report describes a clinical case wherein same measures were adopted for the management of a patient who came with severe mandibular ridge resorption through a modified impression technique along with physiologic registration of the neutral zone.

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