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CASE REPORT

NEUTRAL ZONE TECHNIQUE IN OBTAINING DENTURE STABILITY IN RESORBED MANDIBULAR RIDGES

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ABSTRACT

Resorption of mandibular ridge poses a challenge towards fabrication of a successful stable mandibular denture. Neutral zone concept plays a significant role in overcoming these challenges. Neutral zone is the area where the forces between the tongue on one side and cheeks and lips on other side are neutralized. This technique is most effective in cases where there is highly resorbed ridge along with history of denture instability. This case report also describes a way to record flabby tissue over the ridge using Hobkirk technique.

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INTRODUCTION

The stability of complete dentures depends upon the surrounding neuromuscular system in the oral cavity[1].Oral functions like speech, mastication, swallowing, smiling involves the actions of the tongue, lips, cheeks, and the floor of the mouth that are very complex. Neuromuscular control is the key for the stability of dentures. Size and position of denture teeth and the contours of polished surface all play a crucial role in denture's stability as they are subjected to forces from the tongue, lips, and cheeks when they interfere with the function of oral structures (Yeh, 2013). The stability and retention of complete dentures become unfavorable when ridge resorption increases drastically especially in the mandible. Implant overdentures provides long-term prognosis when oral hygiene is maintained well and a more stable outcome is obtained compared to the conventional complete dentures[2]. Therefore, different techniques must be considered to improve retention and stability in severely atrophic ridges for fabricating a denture in harmony with the forces that are being exerted by the tongue, lips, floor of mouth and cheeks (Yeh, 2013). The aim of the Neutral zone is to construct a denture in muscle balance. If the denture is not at all in harmony with the neutral zone there will be lack of stability, discomfort to the patient and patient will face problems during speech due to ill fit of the denture. The neutral zone 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 or lips are equal (The glossary of prosthodontic terms, 2005)". It was first described by Wilfred Fish who reported the influence of the polished surfaces on retention and stability of complete dentures in 1931 (Yeh, 2013). Fish stated that "polishing surface contour should match the shape of the tongue, lips, and cheeks". These tissues would exert pressure on the dentures, and maintain them in place rather than dislodge them (Fish, 1931). The Neutral zone approach has been used for many patients who have had a partial glossectomy, motor nerve damage to the tongue or mandibular resections.

CASE REPORT

A 67-year-old female patient visited department of Prosthodontics for a new complete denture. She complained of lower complete denture loosening. Although her lower complete denture was refabricated a couple of times earlier, she was not quite happy with it. Due to financial constraints she did not agree for implant over denture therapy. Intraorally, the upper arch form was ovoid with adequate height. However, the mandibular arch revealed severe ridge loss combined with a knife-edge form posteriorly. Mandibular anterior region of the ridge showed loose flabby tissue. A panoramic radiography showed the lower arch with severe ridge resorption.

PROCEDURE

A detailed intraoral examination was done. The previous denture was examined in the patient's mouth and was found to be unstable and not retentive.

Figure 1. Intraoral view of maxilla and mandible

Figure 2. Hobkirk technique

The mandibular ridge was highly resorbed with slight flabby tissue in the anterior region and maxillary ridge was relatively less resorbed. Primary impression was made using alginate impression material with edentulous perforated trays for maxillary and mandibular ridge. Primary casts were obtained. Custom trays were fabricated and border molding was done using low fusing impression compound (green stick DPI Pinnacle) and wash impression was made for maxillary arch with zinc oxide eugenol paste. Custom tray was fabricated for mandibular arch using two sheet thickness wax spacer on the flabby tissue and single sheet wax spacer on the rest of the ridge and border molding was done. Wax spacer was removed prior to recording the wash impression.

Figure 3. Light body wash impression

Figure 4. Denture base with v loops

Figure 5. Neutral zone record

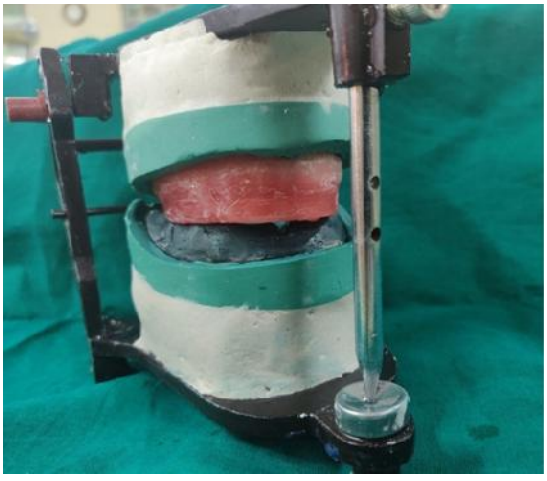

Figure 6. Verification of the record in relation to previously obtained vertical dimention

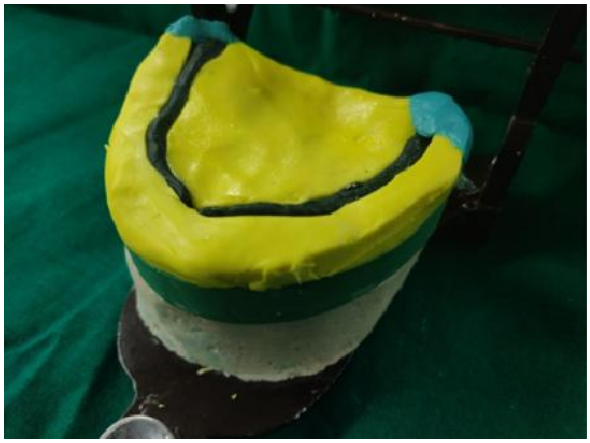

Figure 7. Putty index made around the record

Figure 8. Teeth arrangement

Figure 9. Pre-operative view of patient

Figure 10. Post insertion

Using 'Hobkirk technique' multiple relief holes were drilled in the anterior portion of the tray in the region of flabby tissue for escape of the wash impression material so as to record the anterior flabby tissue in mucostatic position using light body polyvinyl siloxane material (Yazdanie, 1997). The impressions were evaluated for proper accuracy and master cast was poured using dental stone after beading and boxing the impressions. Wax rim records were made and maxilla mandibular relationship was recorded for vertical dimension and centric relation. The rims were then fused in the mouth and this record was transferred to the mean value articulator and mounted. A new set of mandibular denture base was made with 'v' shaped wire loops for recording the neutral zone space. These loops were made to provide the neutral zone recording medium with vertical stability. This was checked in the patients mouth and an admix of impression compound and green stick was mixed in hot water (3:7 ratio) and placed on the denture base. The patient was asked to sit in an upright and comfortable position. The admix material was then placed sections first on the right side and patient was asked to perform a series of actions like puckering swallowing blowing tongue movements and were asked to pronounce phonemes.

The patient was asked to perform these actions till the material set hard. Then the same was done on the left side and then followed by the anterior region. After the neutral zone was recorded it was examined carefully in the mouth to check for stability. It was then cleaned under normal cold water and placed on the mandibular cast. Indexing was done around this recorded area with heavy body putty material in two parts, one buccal and one lingual. This was done for easy removal and placement of the putty index. Once the putty material is set it is removed and the neutral zone record is removed from the master cast. A new denture base was fabricated on the master cast for carrying the wax occlusal rim. The index is placed back on the cast and stabilized and molten wax is poured into the space created to make the lower wax rims. The mandibular rim is adjusted to the vertical height recorded in jaw relation to the maxillary rim. Teeth are set in this space. During setting the teeth the index is placed back and checked for proper position within the index. The trial denture is then evaluated in the patients mouth and checked again for stability

DISCUSSION

Generally the lower denture becomes less stable as compared to the upper denture when residual ridge resorption takes place as age advances. One of the philosophies that was introduced to overcome this challenge of unstable denture is the concept of the neutral zone. The technique we described in this article is different from the conventional technique. The neutral zone in this case was recorded using the swallowing and functional movement technique. The mean value articulator was used in this case. Here Border molding was done with green stick compound, and a secondary impression was made with light body elastomeric impression material for the mandibular arch and zinc oxide eugenol for maxillary arch. In this case, admix material was the preferred substance for recording peripheral tissues and recording tissue surface in its functional state as it permits the patient to mold the neutral zone with the least amount of time and effort. It helps remove any soft tissue folds and smoothens them over the mandibular bone during the impression procedure while recording the neutral zone space.

Conclusion

Neutral zone technique is by far one of the best alternative techniques in cases where there is highly atrophied mandibular residual ridge. 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 affect or unseat the denture, and also where the forces generated by the tongue are neutralized by the forces generated by the lips and cheeks[6]. The construction of complete mandibular denture to occupy the physiologic denture space with the lingual ledge enhances the mandibular denture retention and stability for atrophied ridge elders[7].

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