Case Report

Rehabilitation of an edentulous mouth with severe mandibular ridge resorption using neutral zone impression technique: a case report

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Abstract:
Alveolar ridge atrophy poses a clinical challenge towards the fabrication of a successful prosthesis. Resorption of denture bearing areas results in an unstable non-retentive dentures associated with pain and discomfort. Prosthetic Rehabilitation of a patient with severely resorbed ridge is the most challenging therapy a prosthodontist can undertake. For a favourable prognosis of the denture therapy, impression technique selected should be based on the present state of the basal tissue support. This article presents rehabilitation of a patient with severely resorbed mandibular ridge with the application of neutral zone concept being incorporated into impression making in an effort to achieve successful complete denture therapy. Finally, patient had more stable, retentive and functionally efficient complete denture. In conclusion, neutral zone impression technique proved to be a quite effective method for prosthetic rehabilitation of patient with severe mandibular ridge resorption.

Keywords: alveolar ridge; impression technique; neutral zone; rehabilitation

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Introduction:

The potential space situated between lips and cheeks on one side and tongue on other sides is known as neutral zone[1], where the forces between the tongue and cheeks or lips are equal[2], which determines the retention and stability of any prosthesis placed in the oral cavity to replace the missing teeth.

Residual ridge resorption is a complex biophysical process after extraction of teeth and is most dramatic during the first year followed by a slower but more progressive rate of resorption thereafter[3].

The success of any prosthesis depends on the proper position of the artificial teeth within the neutral zone. Failure to recognize the importance of tooth position, flange form and contour often results in dentures which are unstable and unsatisfactory[1]. Neutral zone impression technique is a treatment of choice in patients with atrophic mandible, partial glossectomy, mandibular resections which have led to an unfavourable denture bearing area[1]. This article describes rehabilitation of an edentulous mouth with severely resorbed mandibular ridge using neutral zone impression technique.

Case report:

An 80 year old male patient reported to Department of Prosthodontics, College of Dental Surgery, B. P.

Figure 1: Intraoral view showing severely resorbed mandibular ridge.

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Koirarala Institute of Health Science, Dharan, Nepal, with the chief complaint of difficulty in chewing of food due to complete loss of teeth. The patient gave a history of loss of teeth over a period of three to five years which was due to periodontal causes. The patient was edentulous for the past eight years and was not wearing any denture. The patient did not have any significant medical history.

Treatment Plan

On examination, it was found that both the upper and the lower arches were edentulous and the mandibular ridge was severely resorbed (figure 1). The following treatment options for complete denture were available to the patient.

a. Implant supported complete overdenture.

b. Conventional Complete denture.

c. Conventional maxillary denture and mandibular complete denture with neutral zone technique.

Pros and cons of all options were explained to the patient. He decided in the favour of conventional maxillary complete denture and mandibular complete denture with neutral zone technique as it was inexpensive and non-surgical procedure.

Clinical procedure

The primary impressions of the upper and lower jaws were made with an impression compound (HIFLEX, Impression Composition, PREVESTdenpro, India) and poured with an impression plaster (Plaster of Paris, ?-hemihydrate, Rim Jhim Enterprises, Bikaner, India). The primary casts were obtained and the custom trays were made putting the wax (HIFLEX, Modelling Wax, PREVESTdenpro, India) spacer with handles. The secondary impressions were made in the custom tray with zinc oxide eugenol impression material (DPI Impression Paste, Dental Products of India Ltd, India). During recording of the secondary impression, the patient was asked to open, swallow and speak so as to bring all the muscles into function. The obtained impressions were poured with type III dental stone (Gypstone, super hard dental stone type III, PREVESTdenpro, India). The master casts were obtained and the record bases were fabricated with acrylic (RR Rapid Repair self-cure acrylic, Dentsply India Pvt. Ltd., India), assessed and modified for stability, extension and comfort. Patient was made comfortable in an upright position with the head supported. The impression material (Green Impression Compound; Kerr Corp) was softened in a water bath at about 65? C. The softened compound was kneeled and a roll was formed according to the crest and was attached to the base. The attached roll of compound was reheated in the water bath and was carried into the patient's mouth. With the record base firmly seated, the patient was asked to perform a series of functional actions like swallowing, speaking, sucking, pursing lips, pronouncing vowels, sipping water and slightly protruding the tongue several times which simulated physiological functioning. During function of the lips, cheeks, and the tongue, the forces exerted on the soft compound molds it into the shape of the neutral zone. After a few minutes when the compound had cooled, the record base with the compound rim was removed and placed in cool water bath. Maxillary rim was oriented in the patient's mouth, the height of the lower compound rim was adjusted with a sharp knife and Jaw registration (fig. 2) was carried out.

Figure 2. Jaw relation registration using neutral zone technique for mandibular ridge.

The neutral zone impression was obtained and placed on the master model, locating grooves were cut on the master cast and was mounted on the articulator (Figure 3).

Then, it was covered with a silicone putty index (Aquasil Soft Putty, Regular Set, Dentsply India Pvt. Ltd., India) around the impression on both the labial and lingual sides. The compound occlusal rim was then removed from the base plate and the index was replaced. The index would have preserved the space of the neutral zone. Teeth (Combination AcryPan, Ruthinium Group, Ruthinium Dental Products Pvt. Ltd., India) were arranged exactly following the index. The position of the teeth was checked by placing the index together around the wax (HIFLEX, Modelling Wax, PREVESTdenpro, India) try-in. Once the waxed up trial dentures were ready, they were checked in the patients mouth for

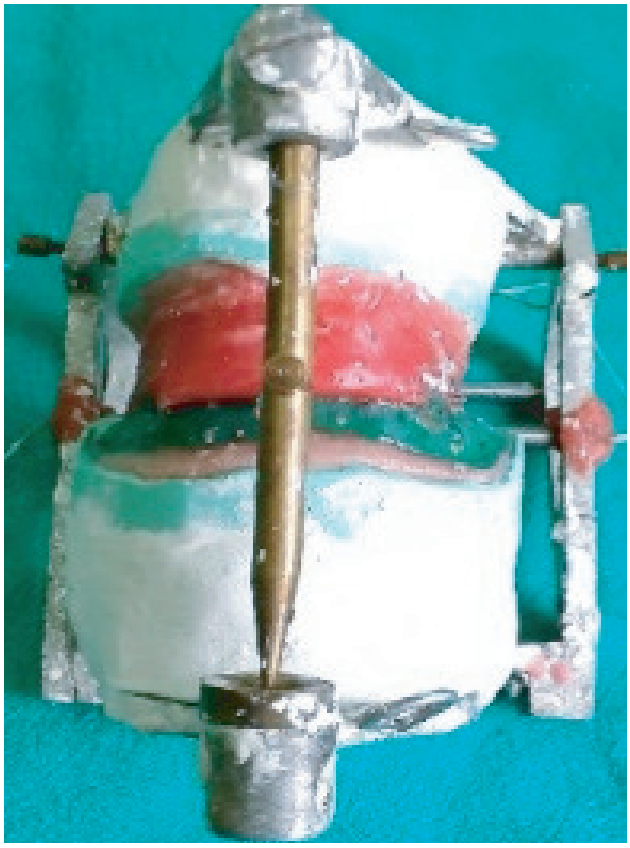

Figure 3. Intermaxillary relation mounted on articulator.

aesthetics, phonetics and occlusion. Later on, wax was removed from the labial and the lingual surfaces of the trial dentures leaving only minimal wax which could support the teeth. Patient was trained for making functional movements such as tongue, cheek and lip movements. Once the patient was trained regarding the functional movements PVS light body (Aquasil Ultra LV Fast Set; Dentsply Caulk) was placed on the labial as well as lingual surfaces of the trial dentures, it was placed in the mouth and patient was asked to perform movements. This procedure was carried out for the mandibular arch. This recorded the polished surfaces of the denture according to the neutral zone. Once the try-in was done satisfactorily, the dentures were processed and finished (figure 4).

Figure 4. Intraoral view with finished maxillary and mandibular denture.

Care was taken during finishing and polishing of the dentures so that the contours recorded previously were unaltered. During insertion the dentures were fully checked to eliminate any minor errors. The dentures provided the patient with improved facial appearance (figure 5), stability and retention during function as they have been constructed in harmony with their surroundings.

Figure 5. Patient after denture insertion with restored smile.

Discussion:

The ultimate goal of any prosthodontic treatment is to restore the form, function, and esthetics of the patient. Fish[4] pointed out that the polished surface of the denture which is bounded by the tongue and the cheeks is influenced by normal physiologic movements such as speech, mastication, swallowing, smiling, and laughing. Hence, the fabrication of the denture must be in harmony with these functions. Because physiologically unacceptable denture is responsible for poor prosthesis stability and retention[6], insufficient facial tissue support, less tongue space and compromised phonetics[1,7].

Denture fabricated over a severely resorbed mandibular ridge by neutral zone impression technique will insure that the muscular forces aid in the retention and stabilization of the denture rather than dislodging the denture during function[1]. The dentures will also have other advantages such as reduced food lodgement, good esthetics due to facial support, proper positioning of the posterior teeth

which allows sufficient tongue space[7]. Clinicians must identify and record the neuromuscular dynamics of the oral tissues and this should be applied in the construction of the definitive prosthesis that will exist within the stabilizing boundary conditions of the neutral zone area[1]. The neutral zone philosophy is based on the concept that for each patient there exists within the denture space a specific region where the function of the musculature will not unseat the dentures and where the forces generated by the tongue are neutralized by the forces generated by lips and cheeks[5,8]. When the residual alveolar ridges have resorbed significantly, denture stability and retention are more dependent on the correct position of teeth and contour of the external surfaces of dentures[5]. The advantage of this method is that the changes that might occur in vertical dimension during recording of the neutral zone can be prevented by the vertical occlusal stops[8].

Conclusion:

With advancement in dental material science and development of newer techniques in prosthodontics, the neutral zone impression technique may be incorporated into fabrication of any complete denture. Though, this is indicated for patients with severe residual ridge resorption, the procedures discussed can also be used for full mouth rehabilitation of edentulous patients with dental implants. This is a very effective technique for providing a more stable, retentive and functionally more effective denture.

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