

Fabrication of Complete Denture with Neutral Zone Technique for a Difficult Lower Jaw

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Case Report

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Abstract: Conventional complete denture therapy for patients with severe residual ridge resorption is challenging. However, the neutral zone technique is considered to be an important alternative approach to patients complaining of unstable dentures. The aim of this article is to describe step by step procedures on the neutral zone technique to reconstruct a lower complete denture for a patient with severe ridge resorption.

Keyword: Neutral zone, neutral zone technique, admixed material, resorbed mandibular ridge.

INTRODUCTION

The dimension of bone is under the influence of numerous systemic and local factors, amongst these local factors are of direct concern to prosthodontists in the design of both complete and partial dentures. Many elderly patients present with severe alveolar resorption and their oral tissues may demonstrate severe age changes [1].

Because of the progressive changes that accompany edentulism, the functional dynamics that define the oral cavity, the loss of the patient's capability to adapt, and increased life expectancy, have posed a challenge for the dentist when restoring and rehabilitating the oral cavity [2].

Resorption of the residual ridges is a continuous process and produces a flat and sometimes concave foundation. This has been called the difficult lower jaw. In edentulous patients, support to the lips and the cheeks is no longer available and they tend to collapse into the oral cavity.

Simultaneously, the tongue will try to expand into the space [2]. When all natural teeth have been lost, there exists within the oral cavity a void which is the potential denture space [2].

A neutral zone is that area in the potential denture space where the forces of the tongue pressing outward are neutralized by the forces of the cheeks and lips pressing inward [2]. According to the Glossary of Prosthodontic Terms -9 the neutral zone is "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 [3]."

Any complete denture that interferes with the actions of the surrounding muscles will therefore lack

stability. This case report has described a step by step procedure for fabrication of complete dentures with neutral zone technique for poor mandibular ridge foundation.

CASE REPORT

A 69 year old male patient reported to department of Prosthodontics and crown & bridge, Sharad Pawar Dental College and Hospital, Sawangi (Meghe) Wardha, with a chief complaint of illfitting previous complete denture because of which he was not able to chew and speak. Medical history was not significant. On intraoral examination maxillary arch was smooth well rounded and no significant resorption, while mandibular arch showed resorption resulting in poor foundation for mandibular complete denture. So,

the treatment formulated as, fabrication of new complete denture with neutral zone technique.

Procedure

The preliminary impressions of maxillary and mandibular arches were made using Y-Dents impression compound (figure 1) and preliminary cast (figure 2) was obtained. The special trays were fabricated for final impression by dough method.



Fig-1: The preliminary impressions of maxillary and mandibular arches



Fig-2: Preliminary cast

Final impressions of maxillary and mandibular arches were made using zinc oxide eugenol Impression Paste (figure3) followed by preparations of casts in type III gypsum product by beading and boxing method.

Two sets of provisional denture bases were fabricated for recording jaw relation by sprinkle on technique. One mandibular record base for conventional maxillomandibular relationship and one for neutral zone record.

Maxillomandibular relation was obtained using Niswonger method and interocclusal checkbite record

for vertical jaw relation and centric jaw relation respectively. (figure 4a and b) Alluwax was used as bite registration material with first record base. Admixed material consisting of medium fusing impression compound and low fusing impression compound in the ratio of 3:7 was kneaded and placed following rim shape on second record base. After placing, the patient was asked to perform actions like swallowing and speaking to induce sufficient muscle contraction. All the actions were performed clearly and vigorously (figure 4 c).



Fig-3: Final impressions of maxillary and mandibular arches

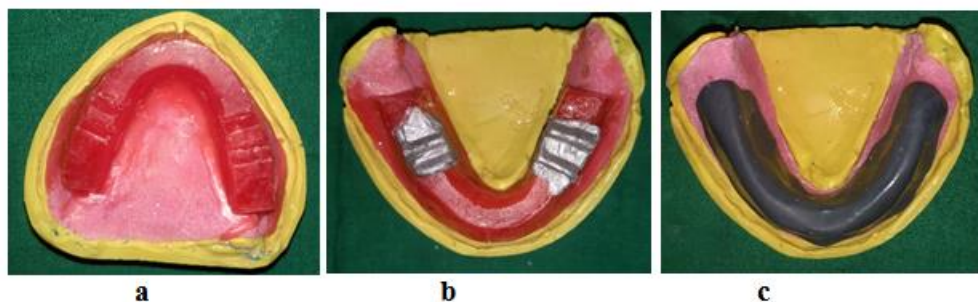


Fig-4: maxillary and mandibular record bases and obtained maxillomandibular relationship (a and b), neutral zone records (c)

Once the neutral zone was obtained, the maxillomandibular relationship that has been established previously was transferred to mean value articulator (figure 5a).

Then, the neutral zone records were transferred to mounted master cast and adjusted over articulator. (figure 5 b) Plaster indices were made around the recorded neutral zone, and wax rims were prepared corresponding to the indices.(figure 6 a,b, c,d,e).

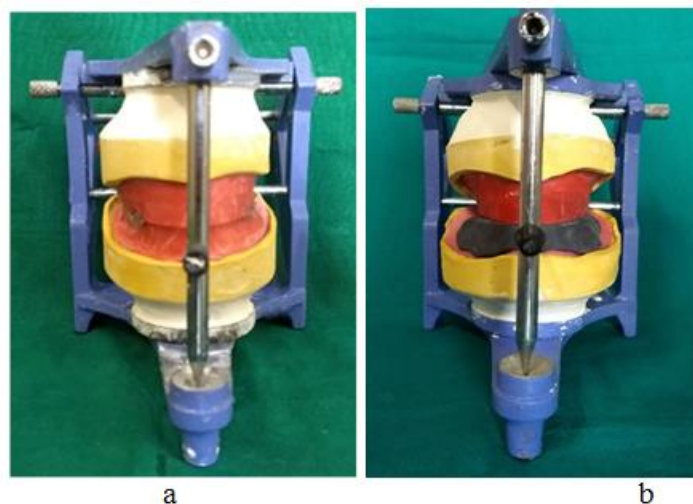


Fig-5: a. Conventional maxillomandibular records b. Maxillomandibular records with neutral zone adjusted on articulator

The mandibular teeth were set in the neutral zone (figure 7-a) followed by complete teeth arrangement, and wax try-in was done. (figure 7-b, c, d).

After the wax try-in was found satisfactory, polished surfaces of the trial dentures were recorded using Zinc oxide eugenol impression paste. The paste was placed on the lingual surface of the lower trial denture base with a liberal amount in the anterior region. Often, a definite shelf was created in this region which

provided a resting place for the tongue and aids considerably in retention. The trial denture was placed in the mouth and the patient was instructed to swallow. The paste was allowed to set and then more of the paste was placed on the buccal and labial surfaces to record their contour. The patient was instructed to place the tongue against the roof of the mouth, to push, and then to swallow. The excess zinc oxide and eugenol impression material was trimmed away from the teeth (figure 8) and the trial dentures were flaked and finished.

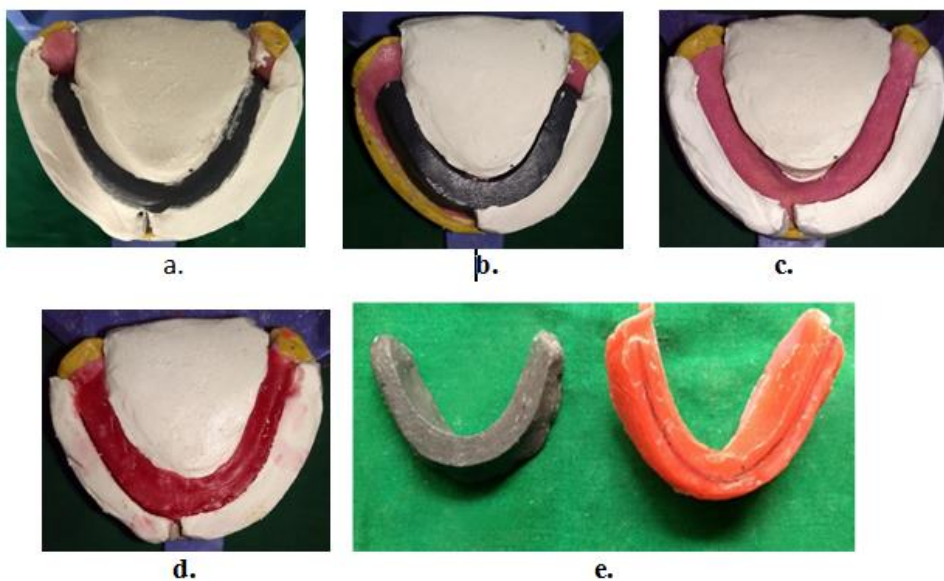


Fig-6: Plaster indices were made around the recorded neutral zone, and wax rims were prepared corresponding to the indices (a,b,c,d,e)



Fig-7: A teeth arrangement in neutral zone, b. Try-in intraoral view

Once the Denture processing was done in conventional manner, it was finished and polished and the dentures were inserted in patients mouth (figure 9) and post insertion instructions were given. These

dentures were followed up for more than 1 year with routine intervals and the new complete dentures successfully improved stability, comfort, and function for the patient.



Fig-8: Recording of Polished surfaces



Fig-9: Intraoral view in occlusion of maxillary and mandibular complete denture

DISCUSSION

In order to construct dentures that function properly not only in chewing but also in speaking and swallowing, we must develop the fit and contour of the external surface of denture just as accurately and meticulously as the fit and contour of the impression surface and the occlusal surface [9]. The influence of the lip on the lower denture stability becomes more critical as resorption of the ridge increases or as the patient becomes older.

In addition, as patient age, the lip instead of being averted as in young individuals becomes thinner and inclines backward into the mouth. So, It is obvious that if we do not determine the neutral zone, and as a result the teeth and flanges are not properly positioned and contoured, the force exerted from the lower lip may constantly unseat the lower denture [8].

The lower posterior teeth are drastically affected by the position of the tongue. If the lower posterior teeth are lingualized excessively, normal tongue function will immediately unseat the denture. The tongue cannot and should not be restricted by the position of the posterior teeth [8].

A force exerted on an inclined plane may be broken down into two components. One component acts in the direction parallel to the inclined plane. The other component, called normal force, acts perpendicularly to the inclined plane. If the inclined planes of the external surface are properly fashioned and the forces are of equal magnitude, the resultant normal force will be in a seating direction. By the same concept, if the dentures are triangular but not properly located within the neutral zone, the lateral force will be unequal and not provide the equilibrium necessary for a stable denture. This will result either in the dislodgement of the denture or unequal pressure on the ridge [8].

The lips, cheeks and tongue in the passive and functioning state exert forces on the natural teeth. In the natural dentition, arch integrity and tooth position are maintained when all the forces generated by the musculature are neutralized. Any changes in the forces generated by the musculature because of increased size, altered muscle function, or abnormal habit patterns will upset the equilibrium and result in alteration of tooth position and arch form [8].

The term "relative position" rather than exact position is used because age, tonus, ridge resorption and

other factors may modify or alter the denture space and neutral zone so that the artificial teeth should not necessarily be in the exact same position as the natural teeth. Furthermore, denture stability is as much or more influenced by tooth position and flange contour as by any other factors [10].

Tench *et al.* were the first in this field and have proposed modeling plastic impression compound as the material to be used for recording the neutral zone. Although this advice is widely followed, other materials such as tissue conditioner, wax, zinc oxide eugenol impression material, silicone material, chairside relining material and acrylic resin are also used for this procedure [7].

Modeling plastic impression compound, being a thermoplastic material, is easy to manage and has the advantages of low cost and ease of availability, whereas wax is temporarily stable and can be contoured over a period of time by functional movements. A tissue-conditioning material was preferred by many authors because of the ease of mixing, elective initial viscosity, and slow-setting properties that enabled capture of the movable tissue morphology in the functional state. Moreover, this material also allows for an incremental molding procedure, which is important in patients with focal neurological deficits and slow or false reactions to various commands. A disadvantage of this material is its relatively high cost. Light-polymerized acrylic resin provides sufficient working time and polishes to a high luster; however, irritation due to the monomer may be a problem [7].

In current case report, Admix material was used for recording the neutral zone. It is a combination of impression compound and green stick (low-fusing) compound in the ratio of 3:7. The mixing of a low-fusing compound with the impression compound results in a low viscosity material allowing for ease in manipulation of the oral musculature. The admix material allowed better flow and an accurate molding [10].

Once the neutral zone has been recorded, its position can be preserved with the help of indexing material like plaster, silicone, stone or modeling plastic impression compound [13]. These indices help to preserve the neutral zone while teeth arrangement procedures. Secondly in this case report, three plaster indices were prepared one covering the lingual aspect and another two each covering buccal aspect upto midline which helped in easy removal and placement [10].

While teeth arrangement anatomic, semianatomic and non-anatomic tooth forms are available. Anatomic tooth resembled natural teeth with transverse ridges intended for tight interdigitation. Also called as "cusp teeth". It is designed to simulate the

occlusal surface of the natural tooth. Available in varying degree of inclinations – the standard is approximately 33°. The angle can be modified by grinding or purchased in a modified anatomic form. When the cusp incline is less than the conventional 33°, it is termed as modified anatomic or semi anatomic teeth. Non-anatomic teeth. They are also called the "cusplless", "monoplane" or "zero degree" teeth. The occlusal surface is essentially flat and has no cusp heights. Non anatomic teeth often indicated in patients with poor neuromuscular coordination, weak denture base foundation, bruxism etc[11].

But, in this report patient had resorbed mandibular ridge with good neuromuscular coordination, so anatomic teeth were selected for teeth arrangements. This technique involves additional laboratory aspects. The neutral zone technique for denture fabrication takes advantage of the stabilizing potential of surrounded soft tissues, instead of being dislodged by them.

CONCLUSION

This article provides an approach in the management of completely edentulous patient with resorbed ridges. The neutral zone technique for denture fabrication has an advantage that it stabilizes the denture with the surrounding tissues, instead of being dislodged by them. Retention and stability are improved especially in the severely atrophic ridges. The technique described is simple and utilizes the routine materials used for denture fabrication, at the same time minimizes the errors in achieving the treatment goals.

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