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Complete Denture Fabrication Using Neutral Zone Technique: A case report

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Abstract

Dentures are removable prosthetic devices that replace missing teeth and their adjacent tissues. The fabrication of complete dentures can be challenging, as they must fit comfortably and function properly. One approach to complete denture fabrication is the neutral zone technique, which aims to create a natural relationship between the denture and the oral tissues. Here we present the case of a 67-year old woman who presented to us asking for a new set of complete dentures since her old ones worn out. She was completely edentulous and was observed to possess a severely atrophied mandibular ridge. We employed the neutral zone technique for construction of her dentures and, after a follow-up period of around 1 week, the patient was satisfied with the results and continuing with her daily activities without any complications at the moment.

Keywords: Complete denture, Fabrication, Neutral zone technique, Prosthodontics, Dental impression

INTRODUCTION

Dentures are removable prosthetic devices that replace missing teeth and their adja-cent tissues. The fabrication of complete dentures can be challenging, as they must fit comfortably and function properly (1). One approach to complete denture fabrication is the neutral zone technique, which aims to create a natural relationship between denture and oral tissues. The neutral zone is the area in the mouth where the forces of the tongue, cheeks, and lips are balanced (2). It is the space between the muscles of the tongue and cheeks and the residual ridges of the jaws. The neutral zone is a dynamic space that changes with the movement of the tongue and cheeks during speech and mastication. The neutral zone technique involves creating a denture that conforms to the natural contours of the oral tissues in this zone (3).

For a prosthodontist, the unstable mandibular full denture presents a straightforward but difficult situation. Chronic, gradual, irreversible, and disabled, residual ridge resorp-tion (RRR) is most likely multifactorial in aetiology (4). RRR is a biological process that occurs naturally and inevitably (5,6). For patients with many, unstable, unretentive man-dibular full dentures, the neutral zone method is beneficial. This method aims to position the teeth in such a way that the forces generated by the muscles of the tongue and cheek are neutralised, therefore teeth remain in a secure, protected area. The concepts of tooth-setting are

traditionally used to determine how teeth are arranged. However, in the neutral zone procedure, each patient's unique oral musculature determines where the teeth should be placed (2,3). The neutral zone has been recorded using a variety of materi-als, including impression compounds (7), tissue conditioners (8), waxes (9), and impres-sion plaster (10), each of which has advantages and limitations of its own. This clinical method involved recording the neutral zone in a patient with a resorbed ridge using tissue conditioner material.

CASE PRESENTATION

Through the means of this investigation, we present the case report of a 67-year old edentulous woman who presented complaining of a loose and worn-out lower complete denture and wanted to have new one fabricated. She had an active lifestyle and possessed positive self-image. Analyzing her medical history revealed that she was controlled hy-pertensive patient and was suffering from bronchitis at the time of presentation. She at-tends hospital for colitis and was hospitalized for gall bladder removal in 1982. She takes Codiovan for high blood pressure, Cholester for raised cholesterol levels and Mezavant XL for colitis.

The patient was edentulous since she was 19 years old due to oral neglect and exces-sive consumption of confectionary. Observing her current prostheses, the teeth were worn down and was very loose as well. Her current prostheses were 20 years old, being her 3rd set. All the previous dentures, including current set were generally satisfactory. There were no problems pertaining to phonation and speech. The eating was good with the existing dentures but used to be better at an earlier period when they were more stable in her mouth. She reportedly complained about the aesthetics pertaining to the prostheses and was particularly not happy with the mandibular denture since it made her lip look de-pressed. In relation to denture hygiene, she reported not wearing mandibular prostheses at night but left the maxillary one worn as it supported her cheeks. The mandibular den-ture was quite loose and presented with decreased retention per se. She wanted to improve her overall aesthetics in the form of whiter natural-looking teeth. A slight median diaste-ma was present which she wanted to preserve.

TREATMENT PLAN

The intra-oral examination of the patient revealed severe RRR in the mandible & moderate in the maxilla, a retracted tongue position, tongue tie, excessive decrease vertical dimension of occlusion, prognathic relation and skeletal class III malocclusion, as evident in figure 1 and 2.

Figure 1: Intra-oral examination of patient

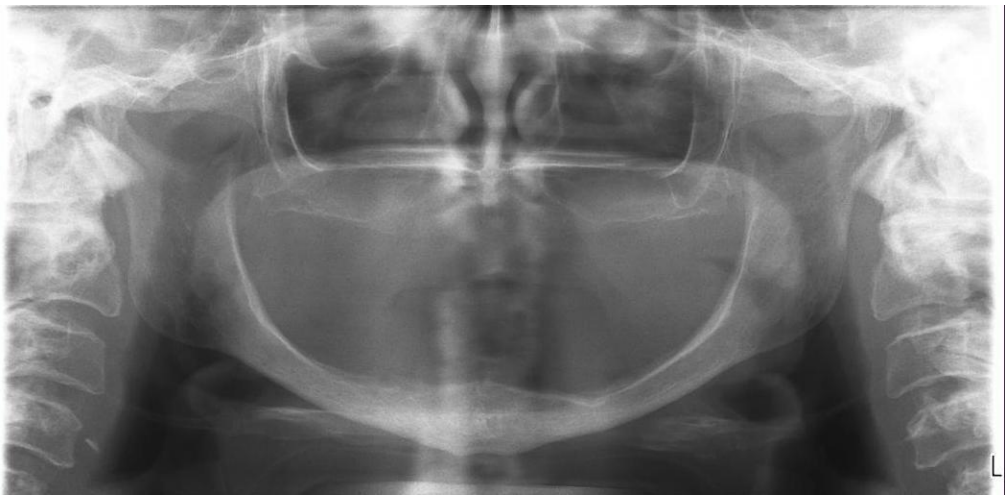

Figure 2: Preoperative OPG X-ray

Initially, 2 treatment modalities were thought of. A new, conventional complete prostheses as compared to an implant-retained prosthesis (either implant over-dentures or a full-arch implant-supported complete dentures). Patient declined any implant placement due to fear of surgery. We decided to pursue conventional prostheses plan, because the existing prostheses was loose with teeth severely worn, with open interocclusal space posteriorly and collapsed occlusal vertical dimension (OVD). Yet, it was totally functional indicating that patient was highly adaptive to conventional treatment. Although treatment would take more number of

visits, the patient welcomed accommodation of the neutral zone technique. Technique was explained in full to her as it aimed to aid in denture's stability for her severely worn down mandibular arch.

Other factors that played a key role in selection of the optimal treatment plan included the following:

- The patient paid great attention to self-image.
- Would never talk without dentures unless covering her mouth even during treatment
- Was very specific about what she wants in her dentures (diastema, natural effects)
- Was in great embarrassment when requested not to wear dentures one day before impressions
- Patient's hair was always coloured and nails always trimmed and polished
- Patient never came or left clinic without fixing make up

The patient was ultimately scheduled for the following visits:

VISIT 1 AND 2

In the first visit, tissue conditioning was performed using (Visco-gel, Dentsply Ltd., U.K.). Vertical composite stops (figure 3) on mandibular denture were placed to guide patient into centric maxillomandibular relationship (CMMR) at slightly increased OVD. Second visit involved further tissue conditioning of traumatized mucosa and further increase to OVD using additional composite at CMMR.

Figure 3: Occlusal composite stops to increase OVD

VISIT 3 AND 4

Primary Impressions and secondary impression were made using irreversible hydrocolloid (Zhermack, Italy) and compound stick (green stick compound (Kerr UK Limited, Netherland) with zinc oxide eugenol (SS White Impression Paste, England) impression materials

respectively (Figure 4). Beading and boxing was performed, Master Casts were poured using type III stone and Post Dam are was carved.

Figure 4: Primary and secondary impressions

VISIT 5

In the fifth visit, wax rim sculpturing, face-bow transfer & jaw relation was were obtained. Temporary mandibular denture base was made with compound pillars to stabilize rims at registered OVD and CMMR posteriorly and with zigzag wrought wire mounted anteriorly in order to retain neutral zone impression material (Figure 5).

Figure 5: Specially made temporary base for neutral zone technique at pre-determined OVD & CMMR

VISIT 6

Neutral Zone Impression Technique (Figure 6) was demonstrated in this visit using tissue conditioner material (Visco-gel, Dentsply Ltd., U.K.). Posterior segment was done first to allow more tongue movement anteriorly followed by anterior addition of tissue conditioner material. Patient was encouraged to completed full range of movements including swallowing, tongue movement, and speaking (Ooo's, Eee's, and Aaa's) before each addition fully set. Duplication of neutral zone impression into wax with preservation of polished denture surface generated through the functional impression. Teeth were set-up using lingualized teeth in balanced occlusion with attention to characterization as per patient's request.

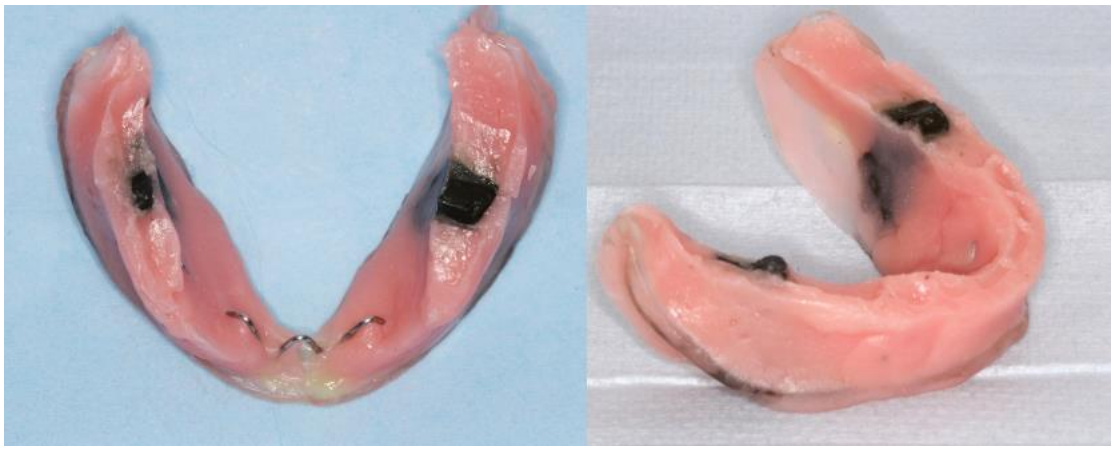

Figure 6: Neutral zone technique and impression using tissue conditioner

SUBSEQUENT VISITS 7

Denture try (Figure 7) in and insertion were done in conventional manner. Patient was reviewed at 24 hours, 1 week, 1 month and after 3 months (Figure 8).

Figure 7: Completed wax-up with preserved polished surface form shaped by muscles and teeth arranged in neutral zone

Figure 8: Post-operative smile photograph after the treatment (after 1 week of follow-up)

DISCUSSION

The first step in the neutral zone technique is to make a preliminary impression of the patient's mouth. This impression is used to create a custom tray that is designed to fit the contours of the patient's mouth. A second impression is then made using the custom tray (2,3).

Once the second impression is made, a bite registration is taken to record the rela-tionship between the upper and lower jaws. Then, a special material is used to records the position of the muscles in neutral zone. This is used to create a trial denture that is evalu-ated for fit, function, and aesthetics. If necessary, adjustments are made to the trial denture to improve its fit and function (2). The final denture is then fabricated using the infor-mation gathered during the previous steps. The neutral zone technique allows for the cre-ation of a denture that conforms to the natural contours of the oral tissues, providing im-proved retention, stability, and comfort. Patients who receive complete dentures fabricated using the neutral zone technique report higher levels of satisfaction and improved quality of life (3,5).

The overall effectiveness of complete dentures in the field of oral rehabilitation, par-ticularly in geriatric prosthodontics, depends on a variety of circumstances. As people live longer, adaptability declines with age, and severe mandibular resorption progresses, it is generally seen that the lower denture is less stable than the upper one. The idea of the neutral zone is one of the philosophical approaches being used in clinics to address the problem of unstable dentures. To accomplish retention and stability in such atrophic mandibular ridges, the neutral zone approach was applied with very minor alterations. Another potential treatment option is an implant-retained over-denture, but retained over-denture, but given its surgical involvement, this was not chosen. The method de-scribed in this article differs from the traditional method in that it requires more patient visits but with the added benefit of making it easier to capture the physiological dynamics of the function of the perioral and oral muscles.

The neutral zone has been recorded using a number of materials over the years, in-cluding waxes, tissue conditioners, polyether, impression compound, and impression plaster. Because of the high viscosity of the impression compound, it is difficult to execute dexterity oral activities including blowing, sucking, and pouting the lips. The patient runs the risk of swallowing plaster pieces while performing functional motions because im-pression plaster is haphazard. To adequately capture fully functional movements, the en-tire wax rims must be

uniformly softened; otherwise, the neutral zone may not be accu-rately recorded. Even when they are supported by wire loops, tissue conditioners can be difficult to use because they lack enough bulk. In our case report, the zigzag form of wire and the segmented additions of tissue conditioner materials addressed the limitations of this material. It is challenging to modify and reuse polyether impression material because it sets through an irreversible chemical reaction (11).

The neutral zone technique is not without its limitations. It requires a high level of technical skill and experience on the part of the dentist and dental laboratory technician. The technique is also time-consuming and can be more expensive than other approaches to denture fabrication. Additionally, the neutral zone technique may not be suitable for all patients, such as those with limited tongue or cheek movement (2).

CONCLUSION

The neutral zone technique is a valuable approach to complete denture fabrication that can provide improved fit, function, and aesthetics. Patients who receive dentures fab-ricated using this technique report higher levels of satisfaction and improved quality of life. Dentists and dental laboratory technicians who are experienced in the neutral zone technique can provide their patients with high-quality, natural-looking dentures that pro-vide optimal function and comfort. Patients who are dissatisfied with complete dentures have found the method to be effective. The dental prosthesis's capacity to endure the vari-ous forces operating on it and the remaining tissues in the ridge area (together with a properly made prosthesis) aid in displacing these forces and contribute to deciding the treatment's success. In the example at hand, all of the aforementioned techniques were used successfully to improve the patient's comfort and appearance while restoring masti-catory effectiveness for a completely edentulous patient.

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