

Assessment of Improvement in Experience of Denture Wearers on Using Mandibular Dentures Fabricated Using Neutral Zone Technique: A Prospective Clinical Study

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ABSTRACT

Background: The purpose of this study was to evaluate any improvement in experience of denture wearers, who could not be provided with implant- dentures, when provided with lower dentures fabricated using neutral zone technique.

Materials and methods: A group of 20 patients was selected and provided with good pairs of complete dentures made conventionally (CVD). After an adjustment period of 30 days they were asked to fill a verified Hindi version of OHIP-14 questionnaire which was believed to reflect their OHRQoL inversely. The group of patients were then given the lower dentures made using neutral zone technique (NZTD). After adjustment phase got over, they were asked to fill the same questionnaires again. The OHIP-14 scores obtained in this way were analyzed using paired-t test.

Results: The mean OHIP-14 H score was significantly more for the denture wearers with CVDs as compared to those wearing NZTDs.

Conclusion: It can be said that neutral zone technique is a good way to improve the function of lower dentures and enhance patients OHRQoL in cases where implant-based treatment is not an option.

Keywords: Denture, fabrication, neutral zone.

INTRODUCTION

Edentulism is a debilitating and irreversible condition and a major health problem affecting millions of people around the world, negatively influencing oral function, social life, and daily activities.¹ It is managed, by the provision of conventional complete dentures, not always successfully, however. Rehabilitation with conventional complete dentures is a great challenge, and anatomic, clinical, technical, and psychogenic factors determine the treatment success.^{2,3,4} In view of this, it might be expected that the tooth loss and wearing of conventional complete dentures could

have an impact on overall quality of life (QoL). Evidence shows the negative effect of edentulism and conventional complete denture therapy on oral health quality of life (OHQoL).^{1,5-9} Maladaptive conventional denture patients can benefit from implant-supported dentures that improve oral comfort and OHQoL.^{10,11, 12} Despite its advantages, implant therapy cannot be available to all edentulous patients because of various economic or patient-related factors. In such situations, few techniques such as use of the neutral zone concept, altered occlusal forms, and denture adhesives can be quite helpful to the denture wearers.¹³

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As an alternative, the advantages of neutral zone technique for the edentulous patients, especially those in which implant-based solutions cannot be provided owing either due to financial or other patient-related problems have been well established. According to the Glossary of Prosthodontic Terms (2005), the neutral zone is "the potential space within the lips and the cheeks on one side and tongue on the other; that area or position where the forces between the tongue and cheeks or lips are equal."¹⁴ The term neutral zone technique was coined by Beresin and Schiesser in 1976.¹⁵ They suggested that the denture teeth should be arranged in the neutral zone as this achieves 2 objectives: teeth do not interfere in the normal muscle function; and the forces exerted by the musculature against the denture are more favourable for stability and retention.^{15,16,17}

The relevant literature adequately reflects the clinical advantages of use of neutral zone technique for difficult mandibular ridges. The ultimate aim for rehabilitating edentulousness is an improvement of OHRQoL of the patient. Therefore, assessment of treatment outcomes by means of patient based outcomes (PBOs) is important. There is widespread consensus that the neutral zone (NZ) concept contributes to improved stability for mandibular complete dentures (CDs). However, little is known about its impact on oral health-related quality of life (OHRQoL) of edentulous patients compared to conventionally fabricated dentures (CVDs). A prospective study was planned to compare the influence of mandibular dentures made conventionally (CVDs) and using neutral zone technique on patients' oral-health related quality of life (OHRQoL).

A 14-item oral health impact profile (OHIP-14), developed from the longer OHIP-49, has often been used to determine impact on OHRQoL following rehabilitation of edentulousness.¹⁸ It covers seven domains: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap. Could NZ mandibular dentures be considered better quality-dentures than CV mandibular dentures and have a more positive impact on treatment outcome? Do patient variables impact on PBOs? To answer these questions, a prospective clinical study was done comparing impact on OHRQoL when edentulous patients were

treated with dentures made conventionally (CVD) and using neutral zone technique (NZTD). The null hypothesis was that the NZTDs denture is not superior to CVDs in terms of OHRQoL. A hindi translated verified version of OHIP-14 questionnaire was used for this purpose.

MATERIALS AND METHODS

Participants

For the purpose of this study, 20 volunteers (10 women, 10 men), edentulous on both arches, especially with highly resorbed lower ridges, and seeking denture treatment, were selected. Their median age was 55 years, and their median time of denture wearing was 10 years. All the participants were seen in the Department of Prosthodontics, Patna Dental College and Hospital, Patna, where they were examined and placed on a Postgraduate student waiting list.

Inclusion criteria were as follows: (1) fully edentulous with existing complete dentures in both arches for at least 5 years before the study, (2) adequate cognitive ability for understanding, answering questions (OHIP-14 Hindi), and completing a form, (3) denture experience (patient should not be a first-time complete denture wearer); (4) full compliance (i.e., ability to attend 9–10 visits) with the study's protocol and objectives.

Exclusion criteria were as follows: (1) temporomandibular disorder symptoms, (2) oral pathology requiring intervention preventing immediate start of fabrication of new complete dentures, (3) parafunction, (4) severe xerostomia, (5) orofacial motor disorders, (6) severe oral manifestations of systemic disease, (7) psychological or psychiatric conditions that could influence response to treatment, and (8) patients wanting dental implants. All participants were informed of the aims and procedures of the study, and consent was obtained regarding their voluntary participation. Required ethical approval was obtained prior to the study.

Two sets of CDs were constructed for each patient. The maxillary dentures were made to be identical for both sets. Standard clinical prosthetic procedures for fabricating dentures were followed. Sequence of visits and materials used are shown in

Table 1. For conventionally made mandibular dentures (CVDs)

1. Primary impressions with edentulous stock trays
2. Definitive impressions with custom trays, border moulding with low fusing impression compound and zinc oxide eugenol impression paste
3. Jaw relation recording with wax occlusal rims
4. Try in of the CV wax trial denture.
5. Try in of NZ wax trial dentures . Polished surface impressions of facial and lingual surfaces using zinc oxide eugenol paste according to Cagna et al.²⁰
6. Remount and delivery of first set of dentures. Recalls

For mandibular dentures fabricated using the neutral zone technique (NZTDs)

1. Primary impressions with edentulous stock trays
2. Definitive impressions with custom trays, border moulding with low fusing impression compound and zinc oxide eugenol impression paste
3. Jaw relation recording with wax occlusal rims
4. Neutral zone impression using low fusing impression compound rim on resin record base according to Cagna et al.²⁰
5. Try in of NZ wax trial dentures . Polished surface impressions of facial and lingual surfaces using zinc oxide eugenol paste according to Cagna et al.²⁰
6. Remount and delivery of second set of dentures. Recalls

For the conventionally fabricated mandibular denture (CVDs), the posterior mandibular teeth were arranged according to a modified Pound triangle; For the NZ mandibular denture (NZTDs), the technique described by Cagna et al. was

followed.²⁰ A lingualised, balanced occlusion without compensating curves was used for both denture sets. Each set of CDs was worn for at least 8 weeks after the last recall visit. Upon delivery of the second set of CDs, the first set was withheld from the patient. Patients were blinded to the type of dentures worn and were not informed on the nature of the difference between the two sets of CDs. Age, sex and denture-wearing history were recorded for each patient. The Prosthodontic Diagnostic Index (PDI) was determined for each patient.²¹

The new dentures were delivered to the patients, who were asked to wear them for 6 weeks, during which all the necessary adjustments were made as required. After this adaptation/adjustment period, and once patients were free of any soreness or discomfort, the study commenced by recording patient's responses to the OHIP-14 H questionnaire.

Oral health quality of life

OHQoL was measured with the OHIP-14-H (Hindi-validated version of the OHIP-14) (Fig. 1).¹⁹ A trained examiner applied the questionnaire during a face-to-face interview. This consisted of 14 items divided in 7 domains (functional limitation, pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap). For each OHIP-14 item, participants were asked how frequently they had experienced the impact of that item. Responses were made on a 5-point Likert scale: 0 "never," 1 "hardly ever," 2 "occasionally," 3 "fairly often," 4 "very often." OHIP-14 total scores, ranging from 0 to 56 points, were obtained by summing the responses on all 14 questions (items). Higher scores imply poorer OHQoL and thus, lower satisfaction of the denture wearer. OHIP-14 total scores were also classified into a low and a high group. We hypothesized that an OHIP-14 total score up to 14 (if all items received a 'never' or 'hardly ever' vote) was considered low, while scores greater than 14 were considered high.

Fig. 1: Verified Hindi translated version of OHIP-14 questionnaire

Question Number	Original version of OHIP-14 ¹⁹	Translated Hindi version of OHIP-14
1.	Have you had trouble pronouncing any words because of problems with your teeth, mouth or dentures?	क्या आपको, अपने दाँतो, मुँह या बत्तीसी में समस्या के कारण शब्दों के उच्चारण में परेशानी हुई है ?
2.	Have you felt that your sense of taste has worsened because of problems with your teeth, mouth or dentures?	क्या आपने महसूस किया कि आपके स्वाद अनुभव करने की क्षमता, आपके दाँतो, मुख या बत्तीसी में समस्या के कारण खराब हुई ?
3.	Have you had painful aching in your mouth?	क्या आपके मुँह में कभी तेज दर्द महसूस हुआ है ?
4.	Have you found it uncomfortable to eat any food because of problems with your teeth, mouth or dentures?	क्या आपको आपके दाँतो, मुख या बत्तीसी में समस्या के कारण भोजन खाने में असुविधा हुई ?
5.	Have you been self-conscious because of your teeth, mouth or dentures?	क्या आप अपने दाँतो, मुँह या बत्तीसी के कारण असहज हो जाते हैं?
6.	Have you felt tense because of problems with your teeth, mouth or dentures?	क्या आप अपने दाँतो मुँह या बत्तीसी में समस्या के कारण तनाव/ परेशानी महसूस करते हैं ?
7.	Has your diet been unsatisfactory because of problems with your teeth, mouth or dentures?	क्या आपको भोजन की खुराक अपने दाँतो, मुँह या बत्तीसी की समस्या के कारण असंतोषजनक लगी ?
8.	Have you had to interrupt meals because of problems with your teeth, mouth or dentures?	क्या आपने अपने दाँतो, मुँह या बत्तीसी में समस्या के कारण भोजन में व्यवधान महसूस किया?
9.	Have you found it difficult to relax because of problems with your teeth, mouth or dentures?	क्या आपको दाँतो, मुँह या बत्तीसी में समस्या के कारण आराम करने में कठिनाई महसूस हुई ?
10.	Have you been a bit embarrassed because of problems with your teeth, mouth or dentures?	क्या आपको अपने दाँतो, मुँह या बत्तीसी में समस्या के कारण कुछ समय के लिए शर्मिदा होना पड़ा ?
11.	Have you been a bit irritable with other people because of problems with your teeth, mouth or denture?	क्या आपने अपने दाँतो, मुँह या बत्तीसी में समस्या के कारण थोड़े समय के लिए लोगों के साथ चिड़चिड़ाहट महसूस की है ?
12.	Have you had difficulty doing your usual jobs because of problems with your teeth or dentures?	क्या आपको अपने दाँतो, मुँह या बत्तीसी में समस्या के कारण रोजमर्रा के कामों को करने में कठिनाई हुई है ?
13.	Have you felt that life in general was less satisfying because of problems with your teeth, mouth or dentures?	क्या आपको अपने दाँतो, मुँह या बत्तीसी में समस्या के कारण जीवन सामान्यतः कम संतोषजनक महसूस हुआ ?
14.	Have you been totally unable to function because of problems with your teeth, mouth or dentures?	क्या आपको, अपने दाँतो, मुँह या बत्तीसी में समस्या के कारण पूर्ण रूप से कार्य करने में असमर्थता हुई ?

RESULTS

Nearly all of the patients showed a significant improvement in oral health-related quality of life (OHRQoL) based on the results of the OHIP-14 (Hindi) evaluation, whereby a higher overall OHIP scores imply a lower level of OHRQoL (Fig.2). Only one patient reported a deterioration in an overall OHRQoL.

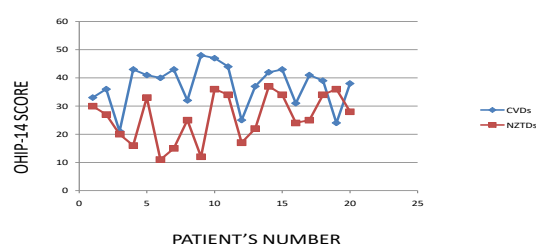


Fig 2: OHIP- 14 score distribution among CVD and NZTD wearers

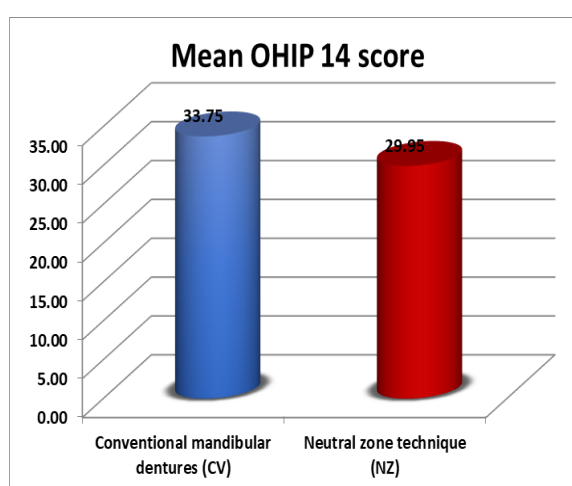


Fig 3: Mean OHIP-14 scores among CVD and NZTD patient groups

Table 1: Showing comparison of OHIP-14 scores among CVDs and NZTDs patients using paired t-test

	Mean	Std. Deviation	Mean difference	t-test value	p-value
Conventional mandibular dentures(CV)	33.75	8.74	3.80	3.090	0.029*
Neutral zone technique (NZ)	29.95	10.64			

The mean OHIP 14 H score was compared between Conventional mandibular dentures(CVDs) and Neutral zone technique (NZTDs). The mean OHIP 14 H score was significantly more among dentures manufactured by Conventional mandibular dentures (CVDs).

DISCUSSION

Most trials assessing OHRQoL and CD satisfaction found an improvement in impacts and ratings after treatment, even though improvement was small and limited to some domains only.^{22, 23,24,24,25} The results of the current trial are in line with these studies, except that the improvements were considerable and for all the domains. The mean OHIP-14 score for CVD wearers was significantly higher in comparison to that of NZTD wearers, which means a poorer OHRQol for the former. The paired-t test was used for this evaluation as the patients' experience with CVDs was considered as pre-NZTD experience.

As the design of the present study did not include a control group, it can be argued that the results present a distorted situation based on a desired answer pattern. In this context, one cannot rule out that patients might be urged, due to having been provided with new set of dentures, to assess denture function and the OHRQol more favourably that they would have done for their initial set of dentures. Hence, the need of a more reliable randomized crossover trial can be indeed recommended.

CONCLUSION

Oral health-related quality of life (OHRQol) improved significantly when edentulous patients received dentures made following NZ techniques as compared to conventionally fabricated dentures. The null-hypothesis this study was started with was

proven wrong. Thus, it can be said that neutral zone technique is a good way to improve the function of lower dentures and enhance patients OHRQol in cases where implant-based treatment is not an option.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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