Original Article

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Dentistry Section

Comparison of Complete Dentures Fabricated by Conventional and Neutral Zone Technique by Assessing the Oral Health-related Quality of Life of the Patients: An In-vivo Study

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ABSTRACT

Introduction: Complete denture therapy is the most extensively used form of treatment for replacement of completely missing dentition as it is most affordable with least amount of complications. In prosthodontics, complete denture is considered successful only when it is harmonious between patient's comfort, aesthetics and function by maintaining an appropriate balance between oral musculature. Patient's satisfaction plays a major role in determining the success during treatment procedures. To have a good treatment outcome, it is eminent for a complete denture to be stable and retentive in the oral cavity. For the denture to be stable, it is necessary for it to be in harmony with the surrounding musculature.

Aim: To compare complete denture prosthesis, fabricated by conventional and neutral zone technique by assessing the Oral Health Related Quality of Life (OHRQoL) of the patients.

Materials and Methods: This was an in-vivo study conducted in the Department of Prosthodontics including Crown and Bridge, Maharishi Markandeshwar College of Dental Sciences and Research, Mullana, Ambala, Haryana, India, from March 2019 to April 2021. A total of 20 completely edentulous patients dissatisfied with their existing dentures were selected based on the following primary inclusion criteria: patients with previously worn complete dentures for at least one year who reported dissatisfaction with function or comfort. Each participant was assessed for baseline OHRQoL using the Oral Health Impact Profile (OHIP)-14 questionnaire before starting the treatment. Two sets of complete dentures were fabricated for each patient: one set using the conventional technique, and a second set where only the mandibular denture was fabricated using the neutral zone technique. Patients were blinded to the nature of the denture received and were randomly allocated to wear either the conventional or neutral zone denture first. Each set was worn for a period of 8 weeks following final adjustment. After each period, patients reassessed their OHRQoL using the OHIP-14 questionnaire. Age, gender, duration of edentulism, and previous denture-wearing experience were recorded for each participant. The compiled data were analysed using the Mann-Whitney U test to compare the OHIP-14 scores between the two denture type. A p-value of <0.05 was considered statistically significant.

Results: The mean OHIP-14 scores showed a marked improvement in OHRQoL from 46.90 (pre-treatment) to 28.90 after rehabilitation with conventional dentures, and further reduced to 19.15 with neutral zone dentures. This indicates a progressive enhancement in patient-perceived oral health outcomes. Mann-Whitney U test revealed a statistically significant difference between the neutral zone and conventional denture groups across all OHIP-14 domains ($p<0.001$), confirming the superior efficacy of the neutral zone technique in improving OHRQoL.

Conclusion: Neutral zone dentures demonstrated improved patient satisfaction and oral health–related quality of life compared with conventional dentures. However, further studies with larger sample sizes and longer follow-up periods are required to confirm these findings.

Keywords: Edentulous patients, Retention, Stability, Support

INTRODUCTION

Interaction of genes and environmental factors results in a complex biological phenomenon called aging. With increasing age many physiological and pathological changes occur which influences the dentition. Depending on the society, the prevalence of edentulism may vary from 6% to 78% [1]. According to World Health Organisation criteria, edentulism falls under physical impairment [2]. Edentulous patients find it hard to perform basic life tasks like eating, talking etc., [3]. Rehabilitation of such patients can be done by complete denture or dental implants. Dental implants greatly improves patient's OHRQoL. However, some conditions like anatomical, medical and financial restriction may prevent the installation of dental implants.

Complete denture therapy remains the most widely used treatment for replacement of missing dentition due to its affordability and predictability. In prosthodontics, complete denture is considered successful only when it is harmonious between patient's comfort, aesthetics and function by maintaining an appropriate balance between oral musculature. Patient satisfaction plays a major role in determining the success during treatment procedures. To have a good treatment outcome, it is eminent for a complete denture to be stable and retentive in the oral cavity. For the denture to be stable, it is necessary for it to be in harmony with the surrounding musculature [4].

Resorption occurs as time progresses especially in mandible, which resorbs faster than maxilla. This results in loss of the stability and retention of the prosthesis leading to unsatisfied patients and their reduced quality of life [5].

Many authors have come up with various theories for improving the retention and stability of the denture for anatomically compromised persons. In 1948, Sir Wilfred Fish described the concept of "neutral zone" where the influence of oral muscles on denture surface was described [6]. This concept describes a zone that is surrounded by the cheeks and lips on one side and tongue on the other side where the forces acting on dentures are minimal. Even though this area exists it is impossible to construct a denture that does not displace at all, that means absolute equilibrium does not exist. Optimum retention, stability and comfort of the patient can be provided with this technique. The better adaptation of prosthesis to the functional space, the more effectively secondary support is achieved from the surface, thus giving increased denture stability during function [7].

It was observed that the musculature where working harmoniously and more effectively when the denture was fabricated using Neutral Zone technique. Numerous clinical studies have revealed the advantages of Neutral zone technique for denture fabrication [8,9]. Al Magaleh WR et al., stated in their study that patients were more satisfied and comfortable with their neutral zone denture when compared to conventional denture [10]. Yeh YL et al., in their study revealed that neutral zone dentures have better adaptability [11].

On the contrary, some studies conclude that conventional dentures are same as neutral zone dentures. Geerts GA in her trial concluded that neutral zone dentures statistically aren't superior to conventional dentures [12]. Similarly, Khan SS et al., in one of their systemic reviews mentioned that patient based outcome of neutral zone showed no strong evidence on the beneficial effects over conventional denture [13].

A general observation shows that subjects reporting to clinics seeking conventional rehabilitation treatment have lower OHRQoL when compared to dentate patients [14,15]. Many studies reveal that rehabilitating a completely edentulous patient has greatly improved not just their chewing ability and appearance but also their OHRQoL and their social function [16-18].

Based on the culture, value system of the patients, expectations and goals, WHO defines the quality of life as individual's perception of life. Quality of life in majority of people is affected by oral health, therefore understanding the relation between denture and its relevance with patients' quality of life can be measured. The OHIP is one such questionnaire, developed to measure the index of the impact of oral health in large surveys. This questionnaire comprises of 14 questions (OHIP 14) based of on chewing efficiency, comfort, cleansability, speech, and treatment outcome [Table/Fig-1].

OHIP- 14 Questions	Never	Hardly ever	Occasionally	Often	Very often
1. Have you had trouble pronouncing any word because of problems with your teeth, mouth or denture?					
2. Have you felt that your sense of taste has worsened because of problems with your teeth, mouth or denture?					
3. Have you had painful aching in your mouth?					
4. Have you found it uncomfortable to eat any food because of problems with your teeth, mouth or denture?					
5. Have you been self-conscious because of your teeth, mouth or denture?					
6. Have you felt tense because of problems with your teeth, mouth or denture?					
7. Has your diet been unsatisfactory because of problems with your teeth, mouth or denture?					
8. Have you had to interrupt meals because of problems with your teeth, mouth or denture?					
9. Have you found it difficult to relax because of problems with your teeth, mouth or denture?					
10. Have you been a bit embarrassed because of problems with your teeth, mouth or denture?					
11. Have you been a bit irritable with other people because of problems with your teeth, mouth or denture?					
12. Have you had difficulty doing your usual jobs because of problems with your teeth, mouth or denture?					
13. Have you felt that life in general was less satisfying because of problems with your teeth, mouth or denture?					
14. Have you been totally unable to function because of problems with your teeth, mouth or denture?					

[Table/Fig-1]: OHIP-14 questionnaire.

OHRQoL is a multidimensional, comprehensive evaluation of oral health and prosthetic rehabilitation along with patient's satisfaction [19]. Several prosthetic designs are being used to rehabilitate edentulous patients but an improvement in patients quality of life can really reflect on the success of the prosthesis. Hence, the aim of the present study was to assess conventional denture and neutral zone denture in terms of OHRQoL.

Null Hypothesis (H_0): There is no significant difference in denture stability or OHRQoL between complete dentures fabricated using the conventional technique and those fabricated using the neutral zone technique.

Alternate Hypothesis (H_1): Complete dentures fabricated using the neutral zone technique provides significantly greater denture stability and improvement in OHRQoL compared to conventional complete dentures.

MATERIALS AND METHODS

This in-vivo study was carried out in the Department of Prosthodontics including crown and bridge, MM College of Dental Sciences and Research, Mullana, Ambala, Haryana, India. Ethical clearance was taken from the ethical committee of the M.M College of Medical Sciences and Research, Mullana, Ambala (Project No: IEC-1570). This study was carried out over a period of two years from March 2019 - April 2021. Completely edentulous patients visiting the Department of Prosthodontics were selected for the study based on inclusion and exclusion criteria.

Sample size calculation: The sample size of 20 patients was determined based on previous literature, particularly the study by Geerts GA, which demonstrated a clinically significant difference in OHIP-14 scores between conventional and neutral zone dentures [12]. Considering a two-tailed paired comparison with a significance level of 5% (α=0.05) and a power of 80% (β=0.20), and an expected effect size of 0.8, the minimum required sample size was calculated using the formula:

$$n = \left(\frac{Z_{\alpha/2} + Z_{\beta}}{d}\right)^2 = \left(\frac{1.96 + 0.84}{0.8}\right)^2 \approx 13$$

To account for possible dropouts and protocol deviations, a total of 20 participants were enrolled in the study to ensure sufficient power.

Inclusion criteria:

- Completely edentulous patients; between the ages of 40-85 years;
- Patients capable of understanding and responding to the OHIP 14 instrument (in English or Hindi);
- Patients who were dissatisfied with their existing dentures
- Patients who require new denture;
- Patients interested in participating in the study;
- Patients must be able to attend 9-10 visits.

Exclusion criteria:

- Patients with TMJ disorder symptoms;
- Patients with severe Xerostomia;
- Patients with severe oral manifestations of systemic disease;
- Patients with orofacial motor disorders;
- Patients wanting dental implants.

Study Procedure

Patient selection and consent: Twenty patients (13 males and 7 females, aged 40-85 years) were selected. Written informed consent was obtained after explaining the study protocol. Each patient completed the OHIP-14 questionnaire before treatment to assess baseline OHRQoL [19]. All 20 patients completed the study protocol without any dropouts.

Each patient completed the OHIP-14 questionnaire prior to treatment to assess baseline OHRQoL. For study purposes, each participant was assessed under three conditions:

- **Intervention I (Pre-treatment):** Assessment of patients with their existing dentures before initiation of treatment.
- **Intervention II (Conventional complete denture):** Assessment after delivery and eight weeks of use of new complete dentures fabricated by the conventional technique.
- **Intervention III (Neutral zone denture):** Assessment after delivery and eight weeks of use of dentures where the mandibular denture was fabricated using the neutral zone technique.

The OHIP-14 questionnaire used in this study to assess OHRQoL is a well-validated and widely accepted instrument. Allen F and Locker D (2002) [14] demonstrated that OHIP-14 possesses strong construct validity and internal consistency when applied to edentulous adults. Further validation by John MT et al., (2004) confirmed its multidimensional structure and reported excellent reliability [15]. These psychometric properties establish the OHIP-14 as a reliable and robust tool for assessing the impact of oral health on patients' quality of life in clinical research.

Randomisation and blinding: To reduce potential bias, a randomised crossover design was implemented. The order of denture delivery (conventional or neutral zone first) was randomised using a computer-generated random number table. The patients were blinded to the type of denture being worn first. Additionally, all procedures were performed by a single experienced clinician to maintain consistency.

For each patient the primary impression was made with impression compound using the non perforated edentulous stock tray. For the final impression, custom tray was fabricated using the self-cure acrylic resin and border moulding was performed with the low fusing impression compound. Final wash impression was made with zinc oxide eugenol impression material and master cast was obtained in dental stone type III. The master casts both maxillary and mandibular were then duplicated using Pouring silicon duplicating material in the duplicating flask. Two sets of master cast was obtained, one set was used to construct the neutral zone denture while the other was used for conventional denture. Temporary denture bases along with occlusal rims were fabricated on the master cast.

Maxillomandibular relation was established by recording the orientation, vertical and horizontal jaw relation. For each set of denture, separate centric and vertical jaw relation was recorded and transferred on semi adjustable Hanau articulator. The vertical height of the maxillary and mandibular occlusal rim was similar in both the sets.

Neutral Zone Registration of Mandibular Arch

Neutral zone was recorded for lower arch using a mixture of low fusing green stick compound and the impression compound; in the ratio of 7:3 by weight. This mixture was heated in a water bath till it could be kneaded and moulded. At this stage, it was rolled and adapted on mandibular record base.

The patient was asked to sit in upright position with their head gently supported. The maxillary occlusal rim was removed while the mandibular neutral zone was being recorded. The mandibular compound occlusal rim was briefly heated in water bath and then placed in patient's mouth. The patient was instructed to perform swallowing and functional movements which includes bilabial (m, p, b), dental (th), labiodental (f, v), alveolar (s, sh) sounds. The words are pronounced loudly and clearly so that the muscles contraction produced are sufficient enough to mould the occlusal rim. The procedure is repeated till the occlusal rim is moulded completely. The excess material tends to extend occlusally was trimmed and adjusted using BP blade to maintain the established vertical height of the occlusal rim [Table/Fig-2].

[Table/Fig-2]: Neutral zone record.

Fabrication of putty index: After the neutral zone was recorded, four V-shaped indentations (three on the buccal side and one on the lingual side) were made on the mandibular cast after which putty index was made around the mandibular compound occlusal rim [Table/Fig-3]. This index allows maintaining the height and width of the occlusal rim, which represents the neutral zone. The mandibular compound rim was retrieved and modeling wax was melted and poured in the space between index. Thereafter, the putty index was removed. This leaves us with a new wax occlusal rim that represents the neutral zone.

Teeth arrangement of neutral zone denture Putty index was used for placing the teeth in neutral zone [Table/Fig-4]. Maxillary anterior teeth were placed according to the functional and aesthetic parameters; whereas the mandibular anterior teeth arranged according to the putty index. The mandibular posterior teeth were arranged in such a way that the mid-section of wax occlusal rim coincides with the central groove of the posterior teeth. The maxillary posterior teeth are then placed according to the mandibular posterior teeth.

Teeth arrangement of conventional denture: The conventional teeth arrangement was done following the standardised guidelines.

[Table/Fig-3]: Putty index.

[Table/Fig-4]: Teeth arrangement in neutral zone.

In mandible, the posterior teeth were arranged according to modified Pound's triangle.

In the following appointment, wax trial was done for both the denture. It was placed in patient's mouth and checked for the aesthetics and occlusion. Any correction that was required was taken care of. Both the trial dentures were processed with high impact heat cure acrylic resin with compression moulding technique.

Insertion of one set of denture: The patients were not educated about the nature of denture that was been given and were blinded to the types of the complete denture. The denture was carefully inserted and evaluated for any occlusal errors. Post-insertion instructions were given and were followed-up till the patient was comfortable with the denture. When the patient was finally comfortable, the patient was asked to use the denture for eight weeks and asked to report back.

Filling of OHIP 14 questionnaires (second set of denture): In this appointment, the subjects were given OHIP-14 questionnaire to fill. This questionnaire had 14 close ended questions that were related to functional limitations, psychological discomfort, pain, social disability, physical disability, psychological disability and handicap.

The response was recorded using 5 grade Likert scale. A low score meant better satisfaction i.e., 1=never, 2=hardly ever, 3=occasionally, 4=often and 5=very often. Patients were asked to read the questions carefully and answer honestly.

Subjects were then given their second pair of denture and were checked for occlusal errors. The patient was asked to follow-up to check for any discomfort or complains. When the patient was comfortable using the denture, they were asked to use this set of denture for eight weeks and report back for further evaluation.

After using the second denture for eight weeks, the patients reported to department and were asked to fill the third questionnaire. On the final appointment, patients directly compared the neutral zone and conventional dentures based on comfort, aesthetics, food lodgment between the denture and cheek, looseness, ability to chew and speak. Patient also determines the final choice of denture.

STATISTICAL ANALYSIS

Descriptive statistics (mean, standard deviation) were calculated for OHIP-14 scores. Mann–Whitney U test was used to compare OHIP-14 scores between conventional and neutral zone dentures. A p-value <0.05 was considered statistically significant.

To minimise response bias, patients were blinded to the type of denture during each trial phase and were instructed to answer questionnaires independently without influence from clinicians or peers.

RESULTS

Participant Demographics

A total of 20 completely edentulous patients (13 males and 7 females, aged between 40-85 years) participated in this within-subject study All 20 patients completed the study protocol without any dropouts.

In patients belonging to Intervention 1 [Table/Fig-5] i.e., previous dentures, the mean obtained for functional limitation, physical pain, psychological comfort, physical disability, psychological disability, social disability and handicap was 4.95±0.75, 6.25±0.78, 7.15±0.58, 7.70±0.57, 7.10±0.71, 7.15±0.36, and 6.60±0.68, respectively. The OHIP total score had a mean of 46.90±0.74.

Parameters	Intervention I (pre-treatment) Mean±SD	Intervention II (conventional denture) Mean±SD	Intervention III (neutal zone denture) Mean±SD
Functional limitation	4.95±0.759	3.75±0.967	2.60±0.598
Physical pain	6.25±0.786	4.05±0.999	3.05±0.945
Pyschological discomfort	7.15±0.587	4.40±1,142	2.80±0.696
Physical diability	7.70±0.571	5.10±1.714	3.20±0.696
Pyschological disability	7.10±0.718	4.35±1.496	2.70±0.733
Social disability	7.15±0.366	4.00±1.298	2.55±0.510
Handicap	6.60±0.681	3.25±1.293	2.25±0.444
OHIP total score	46.901±0.744	28.90±7.100	19.15±2.110

[Table/Fig-5]: Descriptive statistics of mean OHIP-14 scores of OHIP among three Interventions.

In patients belonging to Intervention 2 i.e., conventional dentures, the mean obtained for functional limitation, physical pain, psychological comfort, physical disability, psychological disability, social disability and handicap was 3.75±0.96, 4.05±0.99, 4.40±1.14, 5.10±1.71, 4.35±1.49 and 4.00±1.29, 3.25±1.29, respectively. The OHIP total score had a mean of 28.90±7.10.

In patients belonging to Intervention 3 i.e., neutral zone dentures, the mean obtained for functional limitation, physical pain, psychological comfort, physical disability, psychological disability, social disability and handicap was 2.60±0.59, 3.05±0.94, 2.80±0.69, 3.20±0.69, 2.70±0.73, 2.55±0.51, and 2.25±0.44, respectively. The OHIP total score had a mean of 19.15±2.11.

The mean OHIP scores were compared for functional limitation domain using Kruskal-Wallis test. The difference was found to be significant, with higher scores being reported by Intervention 1, then Intervention 2 and least in Intervention 3. On pairwise comparison using Mann-Whitney U test, significant difference between scores was seen for Intervention 1 and Intervention 2, Intervention 1 and Intervention 3 and Intervention 2 and Intervention 3 [Table/Fig-6].

The mean OHIP Scores were compared for physical pain domain using Kruskal Wallis test. The difference was found to be significant, with higher scores being reported by Intervention 1, then Intervention 2 and least in Intervention 3. On pair wise comparison using Mann-Whitney U test [Table/Fig-6], significant difference between scores was seen for Intervention 1 and Intervention 2, Intervention 1 and Intervention 3 and Intervention 2 and Intervention 3.

	Intervention 1 and Intervention 2	Intervention 1 and Intervention 3	Intervention 2 and Intervention 3
Functional limitation	U=331.5, 0.001*, Sig	U=397.0, 0.001*, Sig	U=334.0, 0.001*, Sig
Physical pain	U=381.5, 0.001*, Sig	U=398.5, 0.001*, Sig	U=300.5, 0.001*, Sig
Pyscological discomfort	U=388.5, 0.001*, Sig	U=400.0, 0.001*, Sig	U=354.5, 0.001*, Sig
Physical disability	U=357.5, 0.001*, Sig	U=400.0, 0.001*, Sig	U=334.5, 0.001*, Sig
Pyshcological disability	U=371.0, 0.001*, Sig	U=400.0, 0.001*, Sig	U=334.0, 0.001*, Sig
Social disability	U=391.5, 0.001*, Sig	U=400.0, 0.001*, Sig	U=337.0, 0.001*, Sig
Handicap	U=391.0, 0.001*, Sig	U=400.0, 0.001*, Sig	U=292.5, 0.001*, Sig
OHIP total score	U=398.0, 0.001*, Sig	U=400.0, 0.001*, Sig	U=390.0, 0.001*, Sig

[Table/Fig-6]: Pair wise comparison among three Interventions.
pair-wise: Mann-Whitney U Test; Level of signifcance set at p<0.05; NS: non significant; Sig: Signficant

The mean OHIP scores were compared for Physcological Discomfort Domain using Kruskal Wallis Test. The difference was found to be significant, with higher scores being reported by Intervention 1, then Intervention 2 and least in Intervention 3. On pair wise comparison using Mann-Whitney U test, significant difference between scores was seen for Intervention 1 and Intervention 2, Intervention 1 and Intervention 3 and Intervention 2 and Intervention 3. Patient with neutral zone dentures were less tense and less self-conscious when compared to from convention and pretreatment denture.

The mean OHIP scores were compared for physical disability domain Kruskal Wallis test. The difference was found to be significant, with higher scores being reported by Intervention 1, then Intervention 2 and least in Intervention 3. On pair wise comparison using Mann-Whitney U test, significant difference between scores was seen for Intervention 1 and Intervention 2, Intervention 1 and Intervention 3 and Intervention 2 and Intervention 3.

Neutral zone dentures resulted in the least physical disability, suggesting improved masticatory efficiency and functional performance compared to conventional dentures and pre-treatment.

The mean OHIP scores were compared for Physcological Diability Domain using Kruskal Wallis Test. The difference was found to be significant, with higher scores being reported by Intervention 1, then Intervention 2 and least in Intervention 3. On pair wise comparison using Mann-Whitney U test, significant difference between scores was seen for Intervention 1 and Intervention 2, Intervention 1 and Intervention 3 and Intervention 2 and Intervention 3.

Neutral zone dentures substantially reduced psychological disability, reflecting higher patient confidence and satisfaction.

The mean OHIP scores were compared for social disability domain using Kruskal Wallis test. The difference was found to be significant, with higher scores being reported by Intervention 1, then Intervention 2 and least in Intervention 3. On pair wise comparison using Mann-Whitney U test, significant difference between scores was seen for Intervention 1 and Intervention 2, Intervention 1 and Intervention 3 and Intervention 2 and Intervention 3.

Neutral zone dentures showed the greatest improvement in social disability scores, indicating enhanced social interaction and quality of life.

The mean OHIP Scores were compared for Handicap Domain using Kruskal Wallis test. The difference was found to be significant, with higher scores being reported by Intervention 1, then Intervention 2 and least in Intervention 3. On pair wise comparison using Mann-Whitney U test, significant difference between scores was seen for Intervention 1 and Intervention 2, Intervention 1 and Intervention 3 and Intervention 2 and Intervention 3.

Neutral zone dentures minimised the handicap domain scores, demonstrating an overall improvement in perceived oral health impact.

The mean OHIP scores were compared for OHIP total domain using Kruskal Wallis test. The difference was found to be significant, with higher scores being reported by Intervention 1, then Intervention 2 and least in Intervention 3. On pair wise comparison using Mann-Whitney U test, significant difference between scores was seen for Intervention 1 and Intervention 2, Intervention 1 and Intervention 3 and Intervention 2 and Intervention 3.

Out of 20 patients, 13 (65%) preferred the neutral zone denture, citing improved stability, comfort, and chewing efficiency. Three patients (15%) preferred the conventional denture, primarily due to familiarity and ease of adaptation. Four patients (20%) reported equal satisfaction with both types. This indicates that the majority of patients experienced greater overall satisfaction with dentures fabricated using the neutral zone technique compared to the conventional method [Table/Fig-7].

S. No.	Type of prosthesis	Patient's preference
1	Conventional denture	3
2	Neutral zone denture	13
3	Both	4

[Table/Fig-7]: Patient's preference.

The main reason of preferred denture showed that most patients found neutral zone denture more comfortable and better fit and some found it better in function and speech.

DISCUSSION

Over the centuries, the concept of health has changed from individual concern to social goal globally, it also comprises of quality of life as a whole. According to the definition given by World Health Organisation (WHO), Health is defined as absence of infirmity or disease and a complete social, mental and physical well-being. As a result of advances in medical science and economical factors, life expectancy is increasing resulting in aging population [18]. Physiological distortion usually accompanies aging leads to reduction in daily activities. Oral functions also are seen to be affected like increased periodontal disease, reduced salivary flow, increased dental caries all of which eventually leading to tooth loss. All this directly influences the chewing efficiency and have a major effect on their quality of life [19,20]. The transition to complete edentulousness causes impairment and disability in elderly population. The most common method of rehabilitation of such people is complete denture.

The trend of dental implant treatment is growing and is widely used. The conventional denture therapy not only remains substantial but also is most affordable option for most of the population. To achieve a successful denture it is critical to determine the correct treatment plan and a careful assessment of the physical condition of the patient. The denture bearing surface and mandibular ridge contribute majorly towards the success of the mandibular denture. Cumulative, chronic and progressive bone loss leads to ridge resorption. Generally, the basal bone remains intact whereas the alveolar bone undergoes severe resorption. This causes quantitative and qualitative resorption of denture bearing surface [5]; eventually leading to denture with compromised prognosis and satisfaction. Oral functions involve the symbiotic actions of tongue, lips, cheeks and floor of the mouth. That means the position of teeth and the flange can affect the stability of the denture.

Although, complete denture is effective option; for some it might not be successful because of various reasons like compromised retention, insufficient ridge height and width, poor supporting tissue etc., several approach has be advocated to overcome these challenges; neutral zone technique is one of the oldest advocated method. It was described in 1931 by Fish [7]. The Glossary of Prosthodontics defines neutral zone as a potential space between the tongue one side and cheeks and lips on the other side, where the forces of tongue, cheeks and lips are neutralised or equal [6]. It can also be called the stable zone or the zone of minimal conflict. Our natural teeth are present in this region and patients using denture also finds it comfortable when their denture is fabricated within this zone. Needless to mention, the denture that lie within this zone are more stable, as these dentures take advance of the potential space and the musculature surrounding it. However, this method is rarely practiced because of lack of knowledge of the clinicians its increased chair side time, complexity of the procedure and increased lab expenses. Many studies reveal the benefits of neutral zone over conventional denture [9-11].

In dentistry, measuring the impact of oral health on a patient's quality of life requires an assessment of the individual's OHRQoL. The OHIP-14 questionnaire is widely used for this purpose due to its specificity in evaluating the functional, psychological, and social impact of oral disorders [14,21]. It has been validated in various populations and demonstrates high internal consistency, with reported Cronbach's alpha values typically ranging from 0.88 to 0.93 [14]. Its reliability and validity have been confirmed in studies assessing edentulous patients and those undergoing prosthetic rehabilitation, making it an appropriate tool for comparative evaluation of treatment outcomes [14,15,21].

For this study modified OHIP-14 was chosen over OHIP-49 because OHIP-49 can be impractical in clinical setting due to its length. The use of this validated questionnaire helps in comparison of the on-going study with various other studies that had been conducted.

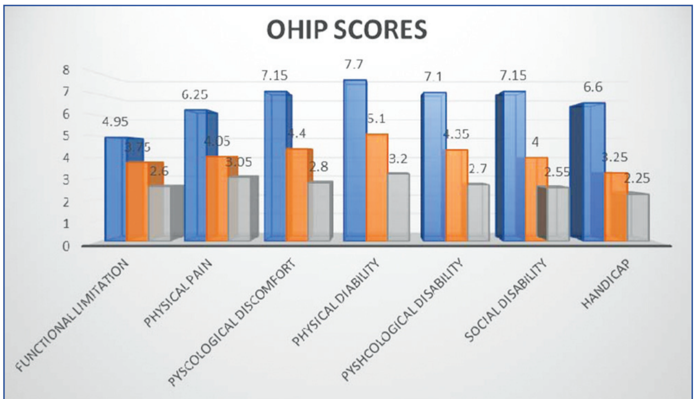
The results of this evaluation confirmed that OHRQoL improved substantially following rehabilitation with complete dentures. Furthermore, the study demonstrated that dentures fabricated using the neutral zone technique provided superior improvements in OHRQoL compared to those fabricated using the conventional technique.

In the present study there was significantly improvement of patient OHRQoL with both type of new dentures, it can be noted that in ill-fitting or problematic dentures patients, replacement of their old denture is seen to have a positive effect on their OHRQoL and denture satisfaction. Similar results were also seen in a study by Adam RZ et al., [22]. This implies the preference of new denture regardless of the technique of fabrication i.e., functional or anatomic techniques. However, the patient may have a totally different opinion of the complete denture than the clinician's judgement [23]. Ultimately, both groups reported improvement in their perception of their oral condition. Both the techniques offered to improve the deficient aspects of the patient's current denture; however, they both were unable to alter the patient's level of acceptance of the genetic shortcoming of complete denture.

Analysing patient's satisfaction with denture and its impact on OHRQoL reflected their extent of relation more than comfort or appearance but till technical correctness of their denture. This varies as ones bearable can be other's intolerable. Therefore patient's interpretation of the difficult they experience with their denture is inherently personal and therefore highly subjective.

It has been reported that aesthetics and speech were the main concerns regarding maxillary denture. There was minimal influence of maxillary denture on patient preference and was assumed to be minimal in this trial as the maxillary denture for both the sets were made identical. It was noted that patients preferred a particular denture due to its comfort, better fit during rest and function. These responses were recorded frequently for neutral zone dentures. A similar conclusion was derived in various studies Where fit, stability, easier chewing and lesser food entrapment were observed in neutral zone denture when compared to existing conventional denture [24]. In this study, most of the patients gave more than one reason for choosing neutral zone and a few patients found neutral zone denture and conventional denture equally satisfying.

The result revealed that when compared to conventional denture, neutral zone denture significantly improved the OHRQoL in all the seven domains that are assessed in OHIP-14 questionnaire. [Table/Fig-8] visually compares the mean OHIP-14 scores for each domain under the three prosthetic conditions. Intervention 1 (Pre-treatment) showed the highest scores, indicating poorer outcomes, while Intervention 3 (Neutral zone denture) showed the lowest scores, reflecting better patient satisfaction.



[Table/Fig-8]: Mean OHIP scores in seven domains in Intervention 1 (Blue -previous dentures), Intervention 2 (Red-conventional dentures), Intervention 3 (Grey-neutral zone dentures).

Similar results were derived in various studies done by Barrenäs L et al., [9] and Miller WP et al., [24]. Generally, the patients were satisfied with neutral zone denture in all aspects but it was noted that functional limitation, psychological discomfort, psychological disability, social disability and handicapped have better scores than other domain.

The one of main complains of edentulous patient is the instability of the denture causing soreness and pain. This may be due to alveolar bone resorption and reduced tissue fit. As the denture is replaced positive impact on OHRQoL was noted. This was further supported by John MT et al., who observed great improvement in his subjects when rehabilitated by complete denture within a follow period of 1-12 months [15].

On the other hand, Forgie AH et al., demonstrated that OHRQoL was not greatly affected by the replacement of new denture when assessed in a study by undergraduate student in the Dental school in England [25]. The difference could be due to different race, socioeconomic status, culture etc. which have a great impact on the quality of life.

Veyrune JL et al., in his study concluded no enhancement in OHRQoL in patients with new denture when followed up after six weeks [26]. It was noted after 12 weeks of use that there was significant improvement in the quality of life. Similar result was notes in Viola AP et al., study that denture wearer population discontinued using denture due to trauma on the mucosa leading to decreased quality of life [27].

For this study, it was critical that patients use their denture for eight weeks after their final adjustment visit. This is the minimum period required for establishing patient preference and was previously used in multiple studies [25,28,29].

Based on the statistically significant differences observed across all OHIP-14 domains ($p<0.001$), the null hypothesis was rejected, indicating that dentures fabricated using the neutral zone technique resulted in significantly better OHRQoL compared to conventional dentures.

Limitation(s)

The present study has several limitations that should be considered while interpreting the findings. First, the duration of denture use was limited to eight weeks, which may not adequately represent long-term adaptation, functional performance, or wear-related changes. Second, subjective satisfaction ratings and OHIP-14 responses may have been influenced by patient-related psychological factors such as expectations, motivation, previous denture experience, and rapport with the clinician. Third, all clinical and laboratory procedures were performed by a single clinician; although this minimised inter-operator variability, it may also have introduced operator-related bias.

Additionally, the clinician was not blinded, which could have influenced patient interactions and responses. Potential confounding variables such as variations in oral anatomy, neuromuscular control, and general health status were not specifically controlled or statistically adjusted for in the analysis. Furthermore, socioeconomic status, dietary habits, and oral hygiene practices—which may also influence patient adaptation and satisfaction—were not evaluated in this study.

CONCLUSION(S)

The OHRQoL significantly improved following the delivery of new complete dentures. Among the two techniques evaluated, neutral zone dentures demonstrated superior outcomes across all seven domains of the OHIP-14 questionnaire- namely, functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. Additionally, patients reported better comfort and satisfaction with the appearance of neutral zone dentures compared to conventional ones.

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