

Clinical Evaluation of Complete Denture using Two Impression Techniques

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Abstract:

Aim: To compare the effect of complete denture fabricated using selective pressure impression and functional impression technique on masticatory efficiency and oral health-related quality of life (OHRQoL) in patients with resorbed ridges.

Materials and Methods: Forty-eight participants with set inclusion and exclusion criteria were randomly allocated into two groups. Complete denture was fabricated in Group A and Group B using selective pressure and functional impression technique, respectively. The follow-up was done at 3 months. Masticatory efficiency was measured by color-changing chewing gum, and OHRQoL was assessed using the Geriatric Oral Health Assessment Index (GOHAI) Hindi Version.

Statistical Analysis Used: The Wilcoxon signed-rank test was applied to check the intergroup analysis for the GOHAI scores of both impression techniques. The Mann–Whitney U test was applied to compare intragroup analysis for masticatory efficiency and the GOHAI scores of both the techniques.

Results: A total of 45 participants completed the follow-up. The mean age of the total participants was 62.7 ± 3.8 . No statistically significant difference ($P > 0.05$) was observed between the masticatory efficiency and post-GOHAI scores of both the impression techniques.

Conclusion: Selective pressure and functional impression techniques may be successfully used to fabricate complete dentures for patients with resorbed ridges.

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Introduction

In India, 34.5% of the total population is urban, and would always remain a prime treatment modality for any resource-strained country. Complete denture rehabilitation aims to improve the patient's quality of life and masticatory

the rest resides in a rural setup. [1] Complete dentures efficiency. Therefore, research must be strengthened in this area to help the patients. [2] The quality of the denture in relation to satisfaction, comfort, stability, and chewing ability is totally dependent on the final impression. [3]

Selective pressure [4,5] and functional impressions [6] are well-accepted techniques for edentulous patients. In their randomized controlled trial, Hyde *et al.*, [7] proved that patients preferred dentures fabricated using the selective pressure technique. They also emphasized the usage of silicone impression materials for final impressions. The oral health-related quality of life (OHRQoL) was also improved after wearing a denture made using

addition silicone impressions. [8] Another suggested technique is functional impressions which accurately record and register mucosal resiliency along with denture base and functional margins. [9] The functional impression technique provides good results along with saving time. It is recommended for geriatric patients with old dentures, ill-fitting dentures, and clinically compromised conditions. [10] Yadav *et al.* [11] have also advised the use of the functional impression technique for better retention, stability, and support in Atwood's orders V and VI.

Although many authors recommend the functional impression, no study has compared it with an already established selective pressure impression technique in cases with resorbed ridges. Therefore, a gap exists in the literature. Many elderly patients with resorbed ridges in our day-to-day practice come for new denture fabrication, and their old dentures can be very well used for making a functional impression.

The study's objectives were to evaluate and compare the masticatory efficiency and OHRQoL of dentures fabricated with the selective pressure impression and functional impression techniques and to evaluate the number of denture adjustment visits after a routine denture follow-up.

The null hypothesis stated that no difference exists in the masticatory efficiency and OHRQoL in complete dentures fabricated using selective pressure and functional impression techniques.

Materials and Methods

A randomized two-arm, parallel-group study was conducted after approval from the institutional ethical committee. A participation information sheet was given to all the participants, and informed consent was taken. All dentures were fabricated between the periods of January 2024 to June 2024.

Using data values from a study done by Wegner *et al.*¹² the sample size was calculated by 80% power and 95% confidence interval. A total sample size of 40 was determined and divided equally into 20 in each group. Considering the dropout ratio of 20%, another eight patients were added, making the final sample size 48. [12]

Following were the inclusion criteria

- Age 60 years or above reporting to the department of dentistry for complete denture fabrication.
- Patients having a complete set of old dentures.
- Having adequately extended peripheral borders and complaints of loosening due to resorption.
- Able to chew adequately though having worn out teeth.
- Patients with a resorbed ridge (American College of Prosthodontists (ACP) Class III and IV).¹³
- Patients who could understand the questionnaire in Hindi.

Following were the exclusion criteria

Patients who refused to sign the consent form, had poor neuromuscular control, had pathological ridge defects, systemic problems, and patients with fractured or badly repaired old dentures were excluded from the study.

After assessment of eligibility, an orthopantomogram was taken. The least height of the ridge was measured to know the ridge status according to the ACP classification [13] using Adobe Photoshop. Then randomization was done by a computer-generated method, and two groups were formed. This study was based on the parallel design compared to the crossover design because, in this design, patients will not have to stay without dentures during the wash-out period.

Random allocation was done by computer-generated sequence for all 48 patients. A single operator did all the procedures. In this study, evaluator and statistician were blinded.

The participants were divided into two groups. Group A complete dentures were made using selective pressure impression, and Group B complete dentures were made using the functional impression utilizing the patient's set of old dentures.

The Hindi version of the Geriatric Oral Health Assessment Index (GOHAI) with a three-point Likert scale of "always-1," "sometimes-2," and "never-3" was used to assess the OHRQoL. [14] Pre-GOHAI questionnaire was administered to both the groups before starting any procedure.

In Group A, a preliminary impression was made using alginate in the metal stock tray, and the diagnostic cast was poured with type 2 dental stone. The maxillary arch spacer of 1 mm was adapted to the cast within the outline borders except in the area of the posterior palatal seal to provide space for the final impression. In the mandibular arch, 1 mm of the spacer was given on the crest and the slope of the alveolar ridge except in the buccal shelf-area. [15] The custom tray was fabricated using auto-polymerizing denture resin. Denture adhesive was applied on the border of the custom tray and kept aside for drying for 15 min as recommended by the manufacturer. Then a single-step border molding was done using heavy body silicone in the upper arch and regular body silicone in the lower arch. After giving relief holes, the final wash impression was made with light-bodied silicone. [8]

In Group B, labial, buccal and lingual extensions of old dentures were trimmed 1-2 mm short, so that functional depth gets recorded in tissue conditioner material. The tissue surface of the old existing denture was also trimmed approximately 2 mm to create space for the material. Tissue conditioner was mixed according to the manufacturer's instruction and carefully applied on the tissue surface of the denture to avoid any air bubbles entrapment. [16] The denture was placed in the patient's mouth with firm pressure. The borders were molded by hand manipulation of the cheeks and lips. About 5 min were given for material to set in the old denture. The patient's tongue was directed to mold the lingual border in the mandibular ridge. [11] The denture was removed, rinsed with water, and evaluated. Later, dentures were given to the patient for functional usage, and proper home care instructions of not to soak the denture in any denture cleaning solution and store it in the air were given. [17] The patient was also instructed to clean the denture in plain running water after every meal and to use wet cotton or gauze to clean the fitting denture surface. The patient reported back after 1 day (within 48 h), and the denture was evaluated for well-rounded functional borders. Then the master cast was poured with Type 3 dental stone.

After getting the master cast in both groups, all the further clinical and lab steps were kept the same. The maxillomandibular records were mounted on a mean

value articulator. Non-anatomical teeth were used for both the groups because, in poor ridge foundation, the least movement was observed with nonanatomic teeth. [18] The denture insertion and routine postinsertion follow-ups were also maintained in both groups.

Denture alteration visits within these 3 months of the adjustment period of the patients after routine follow-up visits were also observed as a secondary objective, as there could be more chances of sore spots corrections in resorbed ridges.

Various tools are available to check the OHRQoL. Ikebe et al. [19] concluded that the GOHAI was more sensitive than OHIP-14. The GOHAI consists of 12 questions, but the last 12th question cannot be applied to denture patients and was not included in the study. The same methodology of removing the last question was also applied by Shigli and Hebbal [20] in their study.

After filling out the post-GOHAI questionnaire, the color-changing chewing gum was used in the patients. [21] The patient was told to chew 60 times, maintaining the rate of one per second. Afterward,

chewing gum was wrapped in two polyethylene films and, with the help of two glass plates, flattened to 1.5 mm thickness. Color analysis was done by observing the changes before and after the mastication procedure. A spectrophotometer and the color scale developed by Hama et al. [22] were used to measure the values of color change. Halazonetis et al. [23] and Tarkowska et al. [21] stated that the masticatory efficiency could be evaluated safely using color-changing chewing gum.

Results

Out of 48 enrolled participants, 45 (23 participants in Group A and 22 in Group B) completed the study. One participant in Group A and two in Group B failed to report back after 3 months of the adjustment period.

The mean age of the total participants was 62.7 ± 3.8 . Out of 45 participants, 88.9% of the patients were 61–65 years old. 4.4% and 6.7% of the patients belonged to the 66–70 and 71–75 years of the age group, respectively [Table 1]. Out of 45 patients, 26 were male and 19 were female. ACP class distribution of participants in Group A and B is shown in Table 2.

Table 1: Age distribution in Group A and B

| Age (years) | n (%) |
|-------------|-----------|
| 61-65 | 40 (88.9) |
| 66-70 | 2 (4.4) |
| 71-75 | 3 (6.7) |
| Total | 45 (100) |

Table 2: American College of Prosthodontists class distribution in Group A and B

| Groups | ACP Class III (%) | ACP Class IV (%) | Total |
|---------|-------------------|------------------|-------|
| Group A | 20 (86.9) | 3 (13.04) | 23 |
| Group B | 18 (81.8) | 4 (18.1) | 22 |

The primary and secondary outcomes were analyzed, keeping a 95% confidence interval. The primary outcome was to evaluate masticatory efficiency and OHRQoL. The pre- and postscores on OHRQoL using the GOHAI questionnaire show a statistically

significant difference ($P < 0.05$) for all the questions except question no. 9, 10, and 11 for both Group A [Table 3] and Group B [Table 4]. No statistically significant difference ($P > 0.05$) was observed between the post-GOHAI scores between Group A and B [Table 5].

Table 3: Comparison of the pre- and post-geriatric oral health assessment index scores on oral health-related quality of life

| Question number | GOHAI | Mean±SD | Z | P |
|-----------------|-------|------------|-------|---------|
| Score | | | | |
| 1 | Pre | 2.17±0.491 | -3.21 | 0.001* |
| | Post | 2.48±0.511 | | |
| 2 | Pre | 2.22±0.671 | -3.50 | 0.0001* |
| | Post | 2.30±0.635 | | |
| 3 | Pre | 1.83±0.491 | -1.80 | 0.05* |
| | Post | 2.17±0.717 | | |
| 4 | Pre | 2.13±0.757 | -3.55 | 0.0001* |
| | Post | 1.48±0.511 | | |
| 5 | Pre | 2.17±0.650 | -3.12 | 0.0001* |
| | Post | 1.83±0.650 | | |
| 6 | Pre | 2.09±0.596 | -2.95 | 0.003* |
| | Post | 1.04±0.209 | | |

| | | | | |
|----|------|------------|-------|-------|
| 7 | Pre | 1.52±0.511 | -1.83 | 0.05* |
| | Post | 1.52±0.593 | | |
| 8 | Pre | 2.52±0.665 | -2.12 | 0.03* |
| | Post | 1.61±0.499 | | |
| 9 | Pre | 2.39±0.499 | -0.71 | 0.7 |
| | Post | 1.52±0.593 | | |
| 10 | Pre | 2.52±0.593 | -1.89 | 0.8 |
| | Post | 1.22±0.422 | | |
| 11 | Pre | 2.30±0.559 | -2.97 | 0.6 |
| | Post | 1.57±0.507 | | |

SD: Standard deviation. *Significant ($P < 0.05$)

Table 4: Comparison of the pre- and post-Geriatric Oral Health Assessment Index scores on oral health-related quality of life in Group B

| Question number | GOHAI | Mean±SD | Z | P |
|-----------------|-------|------------|-------|--------|
| 1 | Pre | 2.05±0.575 | -3.16 | 0.002* |
| | Post | 2.14±0.640 | | |
| 2 | Pre | 2.45±0.739 | -2.53 | 0.01* |
| | Post | 1.32±0.477 | | |
| 3 | Pre | 2.45±0.739 | -2.33 | 0.02* |
| | Post | 1.41±0.734 | | |
| 4 | Pre | 2.59±0.590 | -0.63 | 0.05* |
| | Post | 1.23±0.528 | | |
| 5 | Pre | 1.73±0.550 | -2.64 | 0.005* |
| | Post | 1.50±0.598 | | |
| 6 | Pre | 1.45±0.596 | -1.26 | 0.02* |
| | Post | 1.09±0.294 | | |
| 7 | Pre | 1.59±0.503 | -2.71 | 0.005* |
| | Post | 1.77±0.429 | | |
| 8 | Pre | 2.91±0.294 | -1.89 | 0.05* |
| | Post | 1.23±0.429 | | |
| 9 | Pre | 2.91±0.426 | -0.44 | 0.9 |
| | Post | 1.23±0.528 | | |
| 10 | Pre | 3.00±0.000 | -1.0 | 0.6 |
| | Post | 1.00±0.000 | | |
| 11 | Pre | 1.68±0.477 | -2.82 | 0.7 |
| | Post | 1.41±0.503 | | |

SD: Standard deviation. *Significant ($P < 0.05$)

No statistically significant difference ($P > 0.05$) was also observed between masticatory efficiency in Group A and B. The secondary objective was also nonsignificant as for routine denture adjustments, only one patient of Group A (selective pressure impression technique) reported for denture adjustment of the sore spot.

Table 5: Comparison of post-Geriatric Oral Health Assessment Index scores on oral health-related quality of life in Group A and B

| | Groups | Mean rank | Sum of ranks | Mann-Whitney U | P |
|---------|---------|-----------|--------------|----------------|-----|
| Post Q1 | Group A | 22.24 | 511.50 | 235.5 | 0.6 |
| | Group B | 23.80 | 523.50 | | |
| Post Q2 | Group A | 20.13 | 463.00 | 187.0 | 0.7 |
| | Group B | 26.00 | 572.00 | | |
| Post Q3 | Group A | 19.61 | 451.00 | 175.0 | 0.6 |
| | Group B | 26.55 | 584.00 | | |
| Post Q4 | Group A | 27.20 | 625.50 | 156.5 | 0.9 |
| | Group B | 18.61 | 409.50 | | |
| Post Q5 | Group A | 17.11 | 393.50 | 117.5 | 0.7 |
| | Group B | 29.16 | 641.50 | | |
| Post Q6 | Group A | 26.11 | 600.50 | 181.5 | 0.8 |
| | Group B | 19.75 | 434.50 | | |
| Post Q7 | Group A | 18.22 | 419.00 | 143.0 | 0.9 |

| | | | | | |
|---------|---------|-------|--------|-------|-----|
| | Group B | 28.00 | 616.00 | | |
| Post Q8 | Group A | 25.39 | 584.00 | 198.0 | 0.1 |
| | Group B | 20.50 | 451.00 | | |
| Post Q9 | Group A | 28.63 | 658.50 | 123.5 | 0.9 |
| | Group B | 17.11 | 376.50 | | |
| Post 10 | Group A | 24.72 | 568.50 | 213.5 | 0.3 |
| | Group B | 21.20 | 466.50 | | |
| Post 11 | Group A | 28.22 | 649.00 | 133.0 | 0.1 |
| | Group B | 17.55 | 386.00 | | |

Discussion

As both masticatory efficiency and OHRQoL after fabrication of dentures using two different techniques showed no significant difference, the null hypothesis was accepted. [22]

Items 1-4 in GOHAI are based on trouble related to functional problems in swallowing, speaking, and eating. Both groups found a significant difference between patients' pre- and post-GOHAI scores related to these questions. Item no. 5 and 8 are related to pain and discomfort, showing a significant difference in both groups' pre- and post-GOHAI scores. Other items 6, 7, 9, 10, and 11 are based on psychosocial characteristics. [23]

The statistically significant difference ($P < 0.05$) between the pre- and postscores of the GOHAI questionnaire was seen in all the questions except question no. 9, 10, 11. These items depict behavioral and psychological aspects. No significant difference was seen in these questions in the pre- and post-GOHAI scores of both the groups, probably because of the limitation of a complete removable prosthesis which will always persist and indirectly affect the patient's psychology. Patients' age, education, marital status, income, habits, attitudes, and the socioeconomic background will influence these responses.

There was no statistically significant difference ($P > 0.05$) between the masticatory efficiency and postscores of both the impression techniques for all the questions when evaluating the post-GOHAI questionnaire. Hence, both techniques may be equally acceptable for patients.

The result of this study suggests that the functional impression technique can also be seen as an effective alternative for making an impression in patients with resorbed ridges. The only prerequisite is the availability of an old set of dentures in acceptable conditions with peripheral borders and occlusion. If the extensions are improper, it will not lead to good results. Therefore, sound clinical judgment and skills are required regarding the existing condition of an old denture.

The functional impression has an added advantage of giving psychologic comfort to the patients as they can pre-experience the comfort and stability of

dentures with tissue conditioning material. This technique even provides prior judgment to a clinician about the results.

As there are no previous direct comparative studies on the above-said techniques and materials, the association between previous works of literature is difficult. However, the results of this study follow randomized control trial by Komagamine et al., [24] where the selective pressure impression technique was able to establish early stability of new dentures with fewer postinsertion dentures adjustments. Many studies [25-27] and systematic reviews [3,28,29] have also presented no difference in patient satisfaction, mastication, and quality of dentures fabricated by simplified or traditional/conventional methods.

Sociodemographic variables play a significant role in influencing patient denture satisfaction. In this study, all participants had the same socioeconomic background, as all visited an institute for their denture needs. 58% percent of Males and 42% of females were enrolled in the study. 89% of participants belonged to the 61–65 age group and 84% to ACP Classification III. Keeping all these variables into consideration, baseline balance was reasonably present. Nevertheless, comprehensive sociodemographic characteristics such as education, professional activity, marital status, socioeconomic status, and a span of edentulism along with patient's psychology can be addressed in future studies for better clinical applicability of results. Future studies can also report the minimal clinically significant difference associated with research involving patient denture satisfaction.

The limitation of the study is the small sample size. Longitudinal studies with more sample size can be conducted to support the results and reduce the baseline imbalances. Future studies can also assess the denture acceptance, adaptive skills, masticatory ability, and quality of life of a patient with poor neuromuscular abilities using the same or different impression techniques.

Conclusion

Selective pressure and functional impression techniques may be successfully used to fabricate complete dentures for patients with resorbed ridges.

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