

Effect of Exercises on Masticatory Efficiency during Functional Rehabilitation Period for Complete Denture Patients

Masticatory Efficiency during Functional Rehabilitation

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ABSTRACT

Objective: To compare masticatory efficiency in terms of mean sieve value among complete denture patients with read aloud exercise versus without read aloud exercise at 2nd week & 4th week post insertion of complete denture.

Study Design: randomized control trial, non-probability study

Place and Duration of Study: This study was conducted at the Prosthodontics Department, Punjab dental hospital, Lahore between April 2020 to September 2020.

Materials and Methods: Sixty edentulous patients with age range 45 to 54 years, received conventional complete denture treatment for the first time, they were randomly divided into two equal groups. After insertion of the dentures, patients in group I were asked to read a newspaper three times per day for 4 weeks, while those in group II did not read. The reading duration increased by 5 minutes per week, from 5 minutes in the first week to 20 minutes in the fourth week. Two and four weeks after insertion of the dentures, masticatory performance was assessed using the sieve method.

Results: The results of independent sample t test revealed the significant difference in terms of masticatory performance between group I with read aloud exercises and group II without read aloud exercises at 2-weeks follow up ($p < 0.05$) and 4weeks follow up sessions ($p < 0.05$). The mean and std. deviation for 2-weeks follow up session was 30.40 ± 3.99 for group I and for group II, it was 24.83 ± 2.15 ($p < 0.05$). The mean and std. deviation for 4-weeks follow up session was 37.13 ± 1.47 for group I and for group II, it was 29.60 ± 4.29 ($p < 0.05$)

Conclusion: The results suggest that reading aloud exercises, after complete denture insertion significantly improved masticatory performance. Planned activity of masticatory muscles and tongue muscles assists denture wearers in adaptation to their dentures.

Key Words: Read aloud exercises, masticatory efficiency, complete dentures.

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INTRODUCTION

The use of removable dentures is still a major section in dentistry and is an important reality for many edentulous

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ous patients¹. Complete dentures are one of the most popular and conventional prosthesis to rehabilitate edentulous patients⁴. The most common problem regarding complete denture is loss of retention and stability which in turn effects masticatory efficiency^{2,9}. Apart from appropriate tooth setup with bilateral balanced occlusion, quality of coordination among masticatory muscles play a pivotal role in the stability and chewing efficiency of complete dentures⁵. Masseter, temporalis and tongue musculature have tactile sensations which send sensory feedback and helps in adaptation with new prosthesis during rehabilitation period³. Mastication is performed by rhythmic separation and apposition of jaws, it involves Muscles of cheek and tongue which keeps bolus of food on occlusal surface of tooth¹². Poor mastication makes old patients malnourished thus, prone to systemic illness. Management of edentulous jaws with implant supported prosthesis improves masticatory performance significantly, but is not affordable for every patient⁶. However, planned read aloud exercises that includes continuous movement of the lips, tongue and cheeks muscles may help in training the patients to adapt with

removable dentures and improves their quality of life ⁷. Controlled movement of tongue and buccinator muscles is considered to improve denture stability which can ultimately improve masticatory performance¹². Zmudzki et al, reported that controlled and forceful tongue position improves masticatory performance by supporting mandibular denture⁵. Study by Yamada. A found that repeated chewing gum exercises improved masticatory efficiency upto 20 % ⁴. Tetsuka et al did study on cadavars, and found that there is strong relation between occlusal support and masseter muscle fibers and muscle coordination ¹⁶. The purpose of this study was to investigate if read aloud exercise also has same impact on masticatory efficiency.

MATERIALS AND METHODS

Study Design: The randomized control trial, non-probability (consecutive) study was conducted in prosthodontics department, Punjab dental hospital, Lahore between April 2020 to September 2020. Patients with Temporomandibular disorders, Xerostomia, Orofacial motor disorder, Psychological disturbances and patients who were unable to cooperate were excluded from study.

Study Intervention: Patients who presented in Outdoor of prosthodontics department at Punjab dental hospital, Lahore, among them, 60 edentulous patients with age range 45 to 54 years were selected, using lottery method. 2 groups each of thirty patients were made randomly. After approval from ethical committee of hospital, patients signed informed consent. Conventional complete dentures with (Bilateral balanced occlusion) were fabricated by post graduate students. Patients were called after 24 and 72 hours for follow up to remove any post insertion complaints. Patients of group 1 were given (urdu) newspaper ad insertion appointment and instructed to read it in a loud note 3 times a day for four weeks, reading time will be increased incrementally by 5 minutes per week till 20 minutes in the fourth week. While subjects in group 2 did not perform exercises. However, they were also under observation and recalled for follow up for any post insertion problems. Masticatory performance was analyzed in a chewing test that used a fractional sieving technique at 2 month and 4 month follow up appointments. In clinical settings, at each follow up after assessing denture stability, patients were directed to sit in comfortable manner. 2 patients did not appear for follow up in group A. Patients were instructed to chew peanuts 3g with 20 strokes in a usual manner with no swallowing, peanuts were expelled in glass container. In laboratory of prosthodontics department of Punjab dental hospital\de' Montmorency college of dentistry, Chewed pieces were passed over a standard sieve mesh of number 10 under running water, particles were gathered, all debris removed and dried at 65 degrees C for 30 minutes in an oven. They were separately

weighed afterwards on a digital / electrical balance with a precision of 0.01 g. Calculation of masticatory performance was done by dividing the volume of test food that passed through the sieve by the total volume of food that was recovered.

Statistical Analysis: For statistical analysis, SPSS version 25 was used. Demographic variables of this study were age, gender and edentulous period of each patient, which were calculated as Mean \pm Std deviation and percentages. Data was stratified for age, gender, edentulous period and for masticatory efficiency (after 2 weeks and then after 4 weeks of follow ups). Independent Sample T test was applied and p value<0.05 was considered significant.

RESULTS

The mean age in group I was 52.33 ± 6.89 and for group II, it was 50 ± 7.87 . The mean score difference was found to be non-significant ($p=0.214$) which was calculated by independent sample t test (figure 1). In group I, males were 47.1% whereas females were 52.9% of the total sample whereas in group II, males were 52.9%, whereas females were 47.1% with non-significant difference ($p=0.602$) calculated by Chi-square test (figure 2). In group I participants, mean of months of being fully edentulous was 5.03 ± 2.65 and for group II, it was 5.13 ± 2.55 which was also non-significantly different ($p=0.882$). This showed that both groups were similar in characteristics required for the study (figure 3).

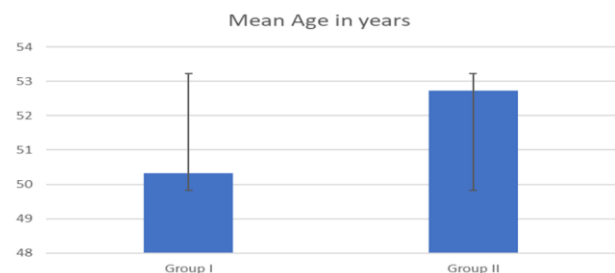


Figure No.1: Mean Age

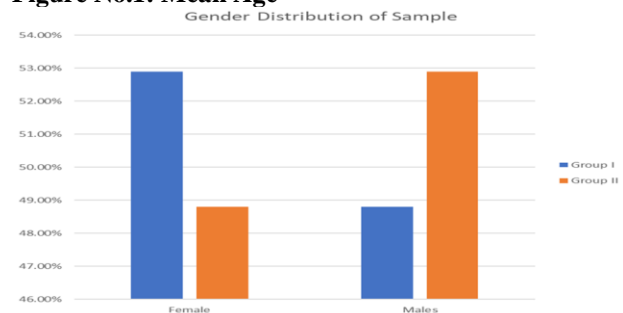


Figure No.2: Gender Distribution

The outcomes of independent sample t-test disclosed significant variations in terms of masticatory performance between group I with read aloud exercises and group II without read aloud exercises at 2-weeks

follow up and 4weeks follow up sessions. The mean and std. deviation for 2-weeks follow up session was 30.40±3.99 for group I and for group II, it was 24.83± 2.15(p<0.001). The mean and std. deviation for 4-weeks follow up session was 37.13±1.47 for group I and for group II, it was 29.60±4.29 (p<0.001) (Table 1).

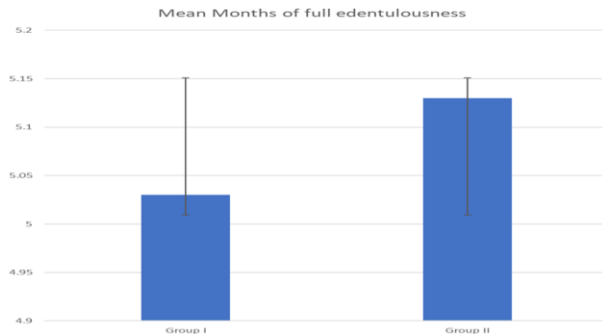


Figure No.3: Edentulous Period

Table No.1: Masticatory Performance

Mean and standard deviation of masticatory performance %inter and intra group comparison.			
	Follow up (2 weeks)	Follow up (4 weeks)	P-value
Group 1	30.40(3.99)	37.13(1.47)	<0.001
Group 2	24.83(2.15)	29.60(4.29)	<0.001
P value	<0.001	<0.001	

DISCUSSION

Complete denture has been a traditional prosthesis for edentulous patients¹. Success of complete denture depends upon technical, biological and psychological interplay between clinician and patient¹³. Masticatory performance is evaluated by subjective methods and objective methods, among objective methods sieve method has been considered as gold standard.⁹ In this study, masticatory performance between 2 groups was evaluated on basis of sieve method because no expensive instruments were required for it. Group 1 who performed read aloud exercises, which were gradually increased in timing, showed a significant improvement in masticatory efficiency on follow up intervals. Results of study gave a strong outcome in favor of oral muscular exercises as they bring neuro muscular coordination. Literature review told us that masticatory muscles have their own implication in masticatory performance of patients¹⁴. Study conducted by Toru Yamazaki, described possible mechanism associated with diabetes and masticatory performance. Decreased consumption of nutrients like dietary fiber and magnesium in participants who were not able to masticate properly due to edentulousness or poorly fitting dentures³ were at risk. Inadequate fiber intake and magnesium or calcium deficiency were found to put these individuals at risk of acquiring type 2 diabetes^{13,3}. Particularly, dietary fiber consumption lowers glucose levels by influencing insulin activity, as soluble fiber has a retarding effect on gastric digestion

and absorption³. Few studies recommend that success of complete denture lies on patient factors and not on dentist factors, insertion of complete denture may alter position of tooth or can affect palatal contours, thus normal phenomena of speech can be disrupted¹⁵. Yu fen chen, found that with adequate or inadequate mandibular denture stability there was lesser level of tongue support i-e 32 percent and 49 percent respectively. Electromyography of signals received by masseter muscle and temporalis showed no significant difference in group who wore denture for first time and who were already denture wearers⁶. Study by Yamada et al, revealed that the variance in performance of masticatory apparatus ranged from 10 to 17 percent when simple regression analysis was done and a variance of 30 percent in crushing ability when multiple regression analysis was done; concluding that the tongue and lip functions do not support a significant coefficient of ascertainment⁴. This can be due to multiple factors such as occlusal contacts, forces of occlusion, mandibular movements and other demographic factors like age and gender, that are linked to masticatory efficiency, besides tongue and lip activity, which may also unfold the variation in masticatory performance seen in the literature^{16,17}. Strong literature demonstrated that oral tactile sensation can only be back with implant supports devices, and patient may get similar sensation like natural dentition and improved masticatory performance¹¹.

CONCLUSION

The results of this study conclude that the masticatory performance can be enhanced after insertion of complete dentures by practicing read aloud exercises. Planned activity of masticatory muscles and tongue muscles assists denture users in adaptation to their prosthesis.

Author’s Contribution:

Concept & Design of Study: Irum Sikandar
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 Data Analysis: Hamna Khawaja, Hafiz Nasir Mahmood, Khalid Yaqub
 Revisiting Critically: Irum Sikandar, Muhammad Waseem Ullah Khan
 Final Approval of version: Irum Sikandar

Conflict of Interest: The study has no conflict of interest to declare by any author.

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