

ASSESSMENT OF PATIENT SATISFACTION AND MASTICATORY EFFICIENCY WITH BALANCED OCCLUSION COMPARED TO CANINE GUIDED OCCLUSION IN COMPLETE DENTURE WEARERS

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ABSTRACT

Various techniques and occlusal schemes have been employed in complete dentures for increased patient comfort and function. This study was done to compare the balanced occlusion and canine guided occlusion among complete denture wearers by assessment of patient satisfaction. Sixty edentulous patients were randomly allocated into two groups. Group A for balanced occlusion and Group B for canine guided occlusion. Two months after denture insertion, patients of both groups were asked to rate their satisfaction levels using a visual analogue scale (VAS) for satisfaction criteria. Masticatory efficiency was analyzed using 15g peanuts divided into 5 equal portions in two separate tests. Test 1 - chewing for 15 seconds and Test 2 - chewing same amount till swallowing threshold. Peanuts collected on a graduated sieve were dried and weighed for both tests. Comparison among groups for outcomes of patient satisfaction and masticatory efficiency separately were insignificant. However there was a significant correlation between overall patient satisfaction and masticatory efficiency. Insignificant difference between the two occlusal schemes showed that occlusal schemes alone have limited role in overall satisfaction. Biological factors, personality traits and patient dentist relationship may also affect the overall satisfaction.

Key Words: Complete dentures, Occlusion, balanced occlusion, canine guided occlusion, patient satisfaction.

INTRODUCTION

Tooth loss leads to a compromise in the integrity of the masticatory system, frequently accompanied by adverse functional and esthetic sequelae. Rehabilitation to restore lost oral structures, function, esthetics and speech with complete dentures has been in practice for a very long time with varying degrees of success. Optimal outcome of complete denture treatment depends on successful integration of prosthesis with patient's oral functions and psychological acceptance of the dentures.¹

Denture stability is dependent on the intaglio, polished and occlusal surfaces. Occlusal schemes based upon various occlusal concepts, form and shape of teeth have been proposed to achieve optimum function and stability of the prosthesis.^{2,3} Among them balanced occlusion, lingualized occlusion⁴, monoplane occlusion, canine guided occlusion have been employed with varying degrees of success.

Balanced occlusion⁵ according to glossary of prosthodontic terms is "bilateral, simultaneous occlusal contact of the anterior and posterior teeth in excursive movements". This occlusal scheme stabilizes the den-

tures and centralizes forces on the residual ridge to protect alveolar bone resorption.⁶ However, this statement has been questioned since the balance is often lost during chewing.⁷ Studies have also demonstrated that balanced occlusion existing at denture delivery is often lost due to frequent post insertion adjustments, cold flow of acrylic and compression of mucoperiosteum under masticatory loads without patients complaining about it.⁷ In natural dentition, canine guidance disengages posterior teeth during excursive movements and reduces elevator muscle activity of the mandible.⁶ Electromyographic studies on patients with complete dentures showed reduced masticatory muscle activity with canine guidance and have shown better response compared to bilateral balanced occlusion.^{8,9}

Several studies have been conducted on different occlusal schemes by various methods to assess increased patient satisfaction.^{6,9-12} The aim of this study was to compare patient satisfaction and masticatory efficiency of canine guidance over balanced occlusion when employed in complete dentures and this was carried out in a sample of Pakistani population.

METHODOLOGY

This was a randomized clinical trial. Convenience sampling of 60 suitable edentulous patients was done and randomly allocated into subgroups i.e. group A for balanced occlusion group and group B for canine guided occlusion. Sample selection was based on the following inclusion and exclusion criteria:

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Inclusion Criteria

Edentulous patients for 1-10 years and between the ages of 45-65 years.

Edentulous patients with regular parabolic ridges with no complete denture experience.

Exclusion Criteria

Asymmetrical, V-shaped, flat or severely resorbed alveolar ridges.

Any soft tissue abnormality, congenital or acquired oro-facial deformity.

Medically unfit patients with neurologic or systemic disorders.

Group allocation was carried out by computer generated tables. Confounding variables in the study included age, sex and type of residual ridge. In order to minimize the effects of these variables, matching technique was used. Apart from the setup of teeth, all the steps of procedures and materials used for complete denture construction were kept constant. All patients were provided tooth setup comprising of teeth over the residual ridge concept. In group A with balanced occlusion, minimum of three point contacts, 2mm overjet and 1mm overbite to keep a low angle of disclusion was established in anterior tooth setup to facilitate balanced occlusion in eccentric movement. In group B, tooth setup was similar to group A but an overbite of 2 mm and reduced overjet on the canines was incorporated to facilitate canine guidance on eccentric movements. After denture insertion, instructions were given to patients about use of dentures and maintenance of oral as well as denture hygiene. Patients were then asked to report after 1 week, 1 month and 2 months after delivery of dentures for any denture related problems.

Subjective analysis (Patient satisfaction)

Two months after denture insertion, patients were given a questionnaire to rate their satisfaction based on five criteria⁶ described as under:

1. Esthetic appearance of dentures
2. Maxillary denture retention
3. Mandibular denture retention
4. Chewing ability.
5. Phonetics.

A visual analogue scale (VAS) was used. Categorization of patient's satisfaction was marked on a scale of 5-1 for each parameter. Where

- 5 stood for Excellent
- 4 stood for Very good
- 3 stood for Good
- 2 stood for Fair
- 1 stood for Poor.

Patients were explained each criteria and its

sub-categories in simple terminology and asked to rate their denture according to their satisfaction level.

Objective analysis (Masticatory efficiency)

Assessment of masticatory efficiency comprised of 02 tests both of which comprised of 15g of peanuts each, divided into five equal portions of 3g. Each test had 5 rounds. Test 1 was chewing for 15 seconds and test 2 was chewing till swallowing threshold. In test 1 patients stopped chewing when the timer rang the alarm at 15 seconds. In test 2 patients were asked to raise their hand to indicate they have chewed adequately and reached swallowing threshold. Number of chewing strokes and time of reaching swallowing threshold was also noted. Patients were asked not to swallow the chewed content but spit it in a bowl of water. They were then asked to rinse (100ml of water) and spit out all the contents in the bowl as well as wash their dentures over the bowl so as to collect all the particles that were attached to denture surfaces. The bowl was then filled with fresh water and the contents were passed through a 10-mesh laboratory test sieve (Mughal Test – U.S Standard testing sieve). For each test, particles collected on mesh were dried over night at room temperature and weighed on an electrical balance having an accuracy of 0.01g (AND HR200. A&D company Japan). A mean weight of material left behind was obtained.

Particles of peanuts collected after each round in both tests were those that did not pass through the mesh. Peanuts not passing through the mesh depicted inefficiency in chewing. Percentage of material passing through the sieve was the masticatory efficiency. It was calculated for the two tests separately by the following formula:

$$\text{Masticatory efficiency} = \frac{(X - y)}{X} \times 100$$

X = total weight of peanuts. y = weight of peanuts left behind on mesh.

Data Analysis

Data was collected and entered into SPSS version 21. The variables like (Aesthetic appearance of dentures, Maxillary and Mandibular denture retention, chewing ability and Phonetics) were assessed and compared in both groups i.e. group A and group B using Chi square test. Each of the five variables had five subcategories i.e. 5 for excellent, 4 for very good, 3 for good, 2 for fair and 1 for poor. The maximum score in subjective analysis was 25 and minimum score was 5. Final satisfaction score was further classified as follows:

- 5-10 = Poor
- 11-15 = Fair
- 16-20 = Good
- 21-25 = Excellent.

Other quantitative variables i.e. masticatory efficiency at 15 seconds and at swallowing threshold

were presented as mean \pm S.D. Independent sample t-test was used to see the difference between treatment groups and above mentioned quantitative variables. In addition, quantitative data of final satisfaction score was correlated with masticatory efficiency by using Pearson's correlation coefficient. The linear relationship between masticatory efficiency at 15 seconds and at swallowing threshold was also assessed using Pearson's correlation coefficient. Scatter diagrams were used to see these relationships. Another Chi-square analysis was used, from combined data of the 5 variables, to check which group had better overall satisfaction. P-value $<$ 0.05 was considered as significant.

RESULTS

In this study, average age of patients was 59.2 ± 5.65 years. There were 35 (58.33%) males and 25 (41.66%) females in this study.

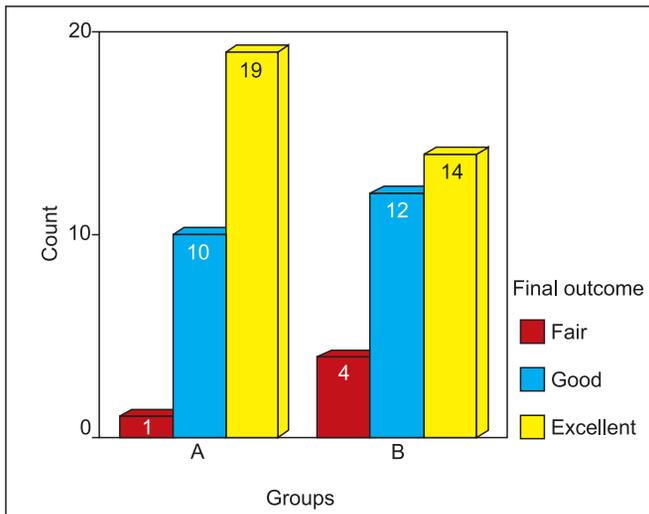
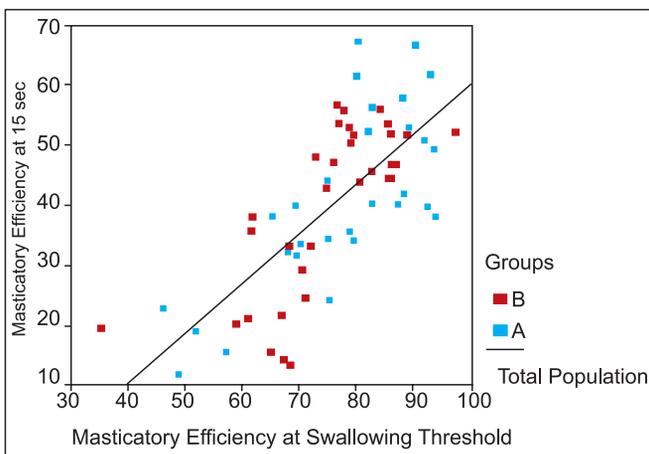
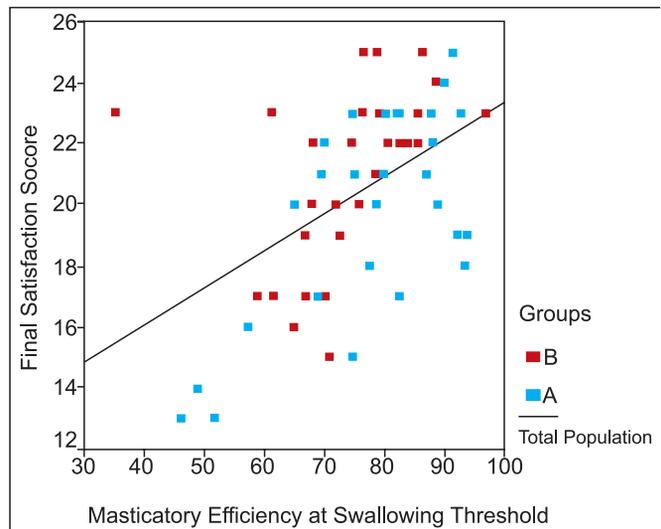


Fig 1: Over All Satisfaction Score With Respect to Treatment Groups



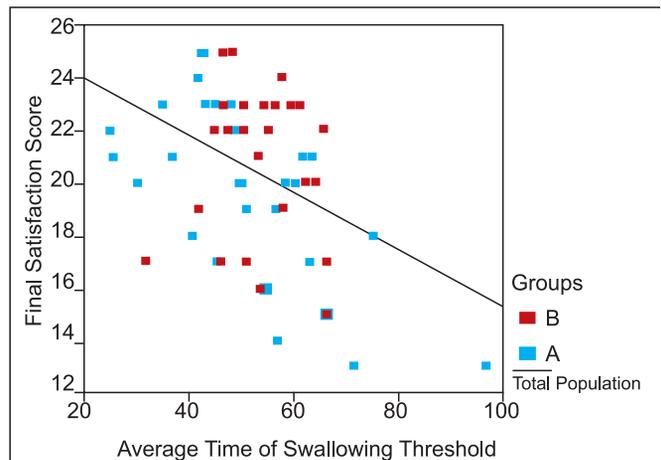
$r = 0.734$, p -value = 0.000 p -value is significant

Fig 2: Analysis of Masticatory efficiency at 15 second and at swallowing threshold



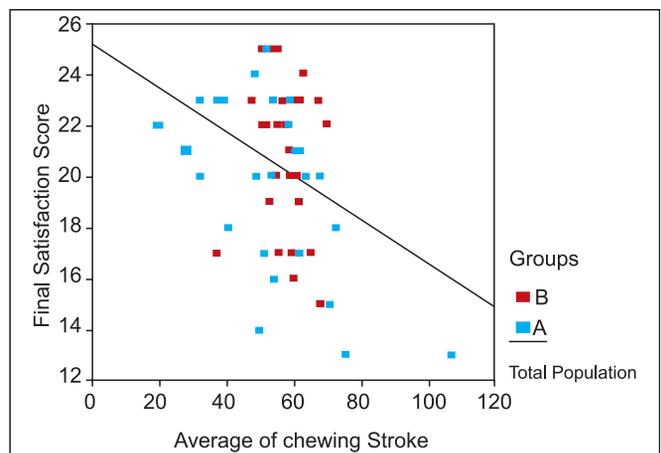
$r = 0.5$, p -value = 0.000

Fig 3: Final Satisfaction Score and Masticatory Efficiency for Swallowing Threshold



$r = -0.4422$, p -value = 0.001

Fig 4: Final Satisfaction Score and Mean Time for Swallowing Threshold



$r = -0.369$, p -value = 0.004

Fig 5: Final Satisfaction Score and Average Chewing Stroke for Swallowing Threshold

TABLE 1: PATIENT SATISFACTION ANALYSIS

	Groups	Grading					Total	P-value
		1 (Poor)	2 (Fair)	3 (Good)	4 (Very Good)	5 (Excellent)		
Esthetic appearance of dentures	A	—	1	2	7	20	30	0.855
	B	—	1	2	10	17	30	
	Total	—	2	4	17	37	60	
Maxillary denture retention	A	—	2	7	3	18	30	0.255
	B	—	1	6	9	14	30	
	Total	—	3	13	12	32	60	
Mandibular denture retention	A	—	2	5	14	9	30	0.181
	B	3	2	6	15	4	30	
	Total	3	4	11	29	13	60	
Chewing ability	A	—	1	14	8	7	30	0.317
	B	1	4	11	10	4	30	
	Total	1	5	25	18	11	60	
Phonetics	A	—	—	3	5	22	30	0.072
	B	—	1	5	9	15	30	
	Total	—	1	8	14	37	60	

TABLE 2: OBJECTIVE ANALYSIS

	Test 1		P value	Test 2		P value
	Chewing for 15 sec			Chewing till swallowing threshold		
	Group A	Group B		Group A	Group B	
Masticatory efficiency (%)	39.02±14.41	41.76±14.90	0.473	73.95±11.95	77.37±13.40	0.302
Average chewing strokes	19.80±1.36	19.2±2.44	0.241	57.65±6.52	52.80±17.63	0.163
Time to reach swallowing threshold (sec)	—	—	—	53.18±7.96	51.37±15.17	0.566

Subjective analysis

All five variable i.e. Esthetic appearance of dentures, Maxillary denture retention, Mandibular denture retention, Chewing ability and Phonetics assessed for patient satisfaction among the two groups were statistically insignificant, having p values more than 0.05. (Table 1)

A graphic presentation of the overall satisfaction in relation to treatment groups is given in Fig 1. Group A patients provided with balanced occlusion appears to be better in overall satisfaction but results are statistically insignificant in both groups. p-value = 0.254.

Objective analysis

Assessment of masticatory efficiency for both groups (chewing for 15 sec and chewing till swallowing thresh-

old) showed insignificant difference in all categories. (Table 2)

Fig 2 shows a strong correlation between masticatory efficiency at 15 sec and at swallowing threshold. A moderate positive correlation between masticatory efficiency at swallowing threshold and final satisfaction score was also found. Final satisfaction score increased as the masticatory efficiency increased. $r= 0.5$ and $p\text{-value} = 0.000$ (Fig 3) Fig 4 and 5 shows correlation between swallowing threshold and number of chewing strokes.

DISCUSSION

The study aimed at comparing balanced occlusion with canine guided occlusion. Patient satisfaction was compared with either of the occlusal schemes employed.

One of the objective of complete denture treatment is esthetics. Waliszewski described good appearance and comfort as inseparable.¹³ Jameson¹⁴ proposed dentogenic concept in denture construction for optimum esthetics and denture success. Peroz⁶ underscored canine guided dentures as esthetically more acceptable to patients when compared to balanced occlusion. The present study noted that satisfactory chewing ability also had an effect on high rating of esthetic appearance and vice versa. Esthetics appearance itself was insignificant among the groups.

In this study, comparison among both groups for satisfaction related to maxillary and mandibular denture retention respectively, group A patients were slightly better satisfied than group B owing to the fact that occlusal harmony increases stability of dentures yet showed insignificant difference statistically. Peroz⁶ states differently that mandibular dentures are better stabilized by canine guidance as they are guided towards the center of the ridge during lateral excursion whereas the same dislodges maxillary dentures. Other than occlusal scheme, physiologic and anatomic factors including shape of alveolar ridge, size and position of tongue also have a role in denture stability.^{15,16}

Satisfaction of group A patients for chewing ability and phonetics was better than group B but statistically results were insignificant. In our study, only 2.3% (7 from group A) and 1.3% (4 patients from group B) rated their chewing ability as excellent. An explanation to this maybe that chewing ability is reduced to 30% that of dentate individuals and adapting to new dentures may take time.¹⁷ Peroz⁶ and Heydecke's¹¹ findings are in favor of canine guided dentures. Difference in phonetic performance was also insignificant between both groups. This means that phonetics is not significantly affected by occlusal schemes^{6,18} but establishment of proper occlusal vertical dimension, occlusal plane, palatal contours and positioning of anterior teeth is important for optimum phonetics.¹⁹

Comparison of overall satisfaction among both groups is in agreement with results of Heydecke¹¹ as being insignificant. Whereas results by Rehmann²⁰ and Peroz⁶ are in favor of balanced occlusion and canine guided occlusion respectively.

In objective analysis, masticatory efficiency was calculated by two masticatory performance tests; chewing for 15 sec and chewing till swallowing threshold using peanuts. Other studies have reported using similar tests²¹ as well as using a fixed number of chewing strokes.²² The present study showed statistically insignificant difference between both groups for both tests i.e. p-value = 0.473 and 0.302 respectively. The minimum and emaximum time taken to reach swallowing threshold was 25 and 97 seconds by patients both from group B. Physiologic factors along with patient

personality may affect the time to reach swallowing threshold and the number of chewing strokes.²³ A positive correlation in both groups between patient's final satisfaction score and masticatory efficiency for 15 seconds and for swallowing threshold respectively depicts that masticatory efficiency increased with the increased satisfaction of the prostheses. A negative correlation existed between patients' final satisfaction score, number of chewing strokes and time taken to reach swallowing threshold. This shows that patients may take longer to reach swallowing threshold with increased number of chewing strokes if they are not satisfied with their dentures.

Factors apart from the occlusal schemes also play a role in patient satisfaction. Patients' attitude toward dental treatment as well as dental professional's attitude towards the patient is also important.²⁴ This was seen in the present study as well. Almost all patients were pleased to receive a phone call for a reminder to report for a checkup and tests to be performed. According to them this showed a sense of care on behalf of the doctors. Carlsson⁷ states that psychosocial factors especially a good relationship between dentist and patient is important for success of prostheses apart from prosthodontic factors. This dentist patient relationship in the present study may have affected patient's manner of rating their satisfaction with the dentures. A blind study with the assessor being oblivious to the patients and their concerns may overcome this factor of biasness from the patients.

CONCLUSION

This study reveals an empirical relationship between patients' satisfaction with their dentures and different variables tested. The conclusion of this study can be that patient satisfaction with balanced occlusion may be better than canine guided dentures but there is an insignificant difference between the occlusal schemes employed. Apart from the occlusal schemes, anatomical factors, psychological factors and personality play a role in adaptation to complete dentures. Esthetics, phonetics and comfort play a role in overall satisfaction of dentures. Patient dentist relationship plays an important role in satisfaction of patient with their dentures.

RECOMMENDATIONS

- Further studies including crossover trials may be conducted on different occlusal schemes for complete dentures.
- Follow-up time may be increased

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| 2 Muhammad Irfan Majeed: | Project collaboration, data acquisition, data interpretation and manuscript review. |
| 3 Bilal Abdul Qayum Mirza: | Literature review, project collaboration, data collection and manuscript preparation. |