Effect of resilient liner on masticatory efficiency and general patient satisfaction in completely edentulous patients

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ABSTRACT

Objectives: To assess the effect of resilient lined denture on patient masticatory efficiency, general patient satisfaction and denture quality as compare to conventional complete denture over a period of one year.

Material and methodology: A total of 28 completely edentulous patients (14 males and 14 females) aged 45 to 60 years, having well-formed ridges were selected following iclusion exclusion criteria. These were divided into two equal groups, i.e. control (provided conventional mandibular complete denture –group 1) and experimental (provided mandibular denture lined with acrylic soft denture liner – group 2). All patients were clinically evaluated to assess the denture quality, and administered questionnaires for masticatory efficiency and patients general satisfaction level at three intervals i.e. one month (T0), 6 months (T1) and 1 year post-insertion (T2).

Results: Statistical analysis for individual question for masticatory efficiency showed significantly higher score (P<.05) at baseline for experimental group as compared to control. While at six and twelve months time interval, significant differences (P<.05) were noted for some questions only. Intra-group analysis showed masticatory efficiency improved significantly over time in controls, while in experimental group masticatory efficiency remained the same (p>.05) for almost all the questions. Patient general satisfaction score at different time intervals for each question showed no significant difference (P>.05) on inter-group comparison. Time dependant intra-group comparison for patient general satisfaction score also showed no significant difference in scores for almost all the questions for both the groups. Statistical analysis for denture quality showed dentures in experimental group have significantly higher (P<.05) scores for denture retention and condition of supporting tissue as compared to control group, while with time denture quality decreased significantly in both the groups.

Conclusion: Dentures with soft liner provided better masticatory efficiency while it had no effect on patient's general satisfaction. Denture quality is better for one with soft liners as compare to one without soft liner.

Keywords: Edentulism, Masticatory, Efficiency

INTRODUCTION

Edentulism leads to significant functional impairment, psychological and social changes in the patients.[1] The problems arising from edentulism range from difficulty in chewing, to poor nutrition, unaesthetic appearance, speech impairment, all leading to a physical handicap.[2,3] That finally effect the general health as well.[4,5,6]

Currently there are different treatment modalities available to treat edentulism depending on the oral conditions, patient acceptability, affordability and the clinician's expertise. Conventional complete dentures are used successfully but patients with badly resorbed ridges with atrophic mucosa or sharp residual ridges have difficulty wearing conventional complete denture and therefore require an alternate treatment modality.[7] Difficulties encountered in such patients can be overcome with either implants or resilient liners.[8,9,10] Although, implants are highly effective, they are not a viable solution for all edentulous patients as bone quality, quantity, medical problem, psychological and financial constraints play an important role in the treatment plan. Resilient liners, on the other hand, have fewer limitations, non-surgical application and low treatment cost. Resilient liners, because of their resilience, act as shock absorbers and distribute functional stress, thus making it comfortable for patient to wear the prosthesis.[11,12,13]

Various studies have evaluated the effect of soft liners on maximum bite force, masticatory performance, electromyography of muscles involved, stress distribution in denture supporting tissues, patient satisfaction and comfort in order to prove their advantages over the conventional heat activated acrylic resin dentures but no definite consensus has been achieved.[14-21]

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Studies have been undertaken to objectively evaluate masticatory efficiency, but the literature is scanty regarding subjective evaluation of satisfaction with masticatory efficiency and general satisfaction with resilient liner lined (RLL) complete dentures.

Since the success of any prosthesis not only depends upon the quality of prosthesis but also on patient's perceived satisfaction with the prosthesis, measuring the prosthetic outcome by questioning the patient himself regarding his satisfaction seems to be more meaningful and has been undertaken in the present study.

MATERIAL AND METHODS

After obtaining the ethical clearance (IESC/T-255.01.06.2012), a total of 28 completely edentulous patients aged 45 to 60 years were selected irrespective of gender. Patients having class I jaw relation, edentulous from last 6 months, well-developed edentulous ridges with firm mucosa were selected. Patients suffering from any systemic disorder that influence bone metabolism were excluded.

Computer generated randomization table was use to divide these patients in two equal (N=14) age- and gender-matched groups, on the basis of mandibular denture lined with resilient liner (experimental or Group B) or without (control or Group A). All patients were provided conventional maxillary compete denture.

The bilaterally balance complete denture was fabricated using standard technique, except one modification at the time of mold packing viz. 2 mm thick heat cure acrylic denture soft liner packed along with heat cure acrylic resin in experimental group.

Data collection

Subjective evaluation of patient satisfaction with masticatory efficiency was done using modified questionnaire based on index by Pocztaruk and Frasca(22) (Table 2). It consists of ten questions with four responses; 'Totally satisfied', 'Satisfied', 'Not sure', and 'Dissatisfied'.

For evaluation of patients general satisfaction, denture questionnaire based on index by Wolff et al(23) consisting of seven questions was used (Table 3). Response for each question ranged from 'Excellent', 'Good', 'Fair', 'Poor', and 'Intolerable'.

Both questionnaires were administered at three intervals- baseline, 6 months and 1 year (T0, T1 and T2, respectively) by a single evaluator. Mean scores were calculated for each question in both questionnaires for both groups.

All patients were evaluated clinically for the assessment of denture quality (retention, stability, support and occlusion) using rating legend given by Woelfel(24). Two independent, calibrated prosthodontists assessed the denture quality at three different time intervals i.e. one month after denture delivery (baseline, T0), 6 months (T1) and 1 year post-insertion (T2). One-month time for adjustment to new prosthesis was given to all patients prior to data collection.

Statistical analysis

Patient generated responses from both the questionnaires were compiled as numeric data. Statistical Package for Social Sciences, Version 13.1 (IBM, Chicago, IL.) was used for all statistical calculations. For both the questionnaires, individual question scores were calculated and represented as mean ± standard deviation. For each question, mean score for controls was compared with experimental at all intervals using non-parametric test (chi square test) and p value less than 0.05 was considered statistically significant. Repeated measures analysis of variance was used for intra-group comparison of mean scores at three time intervals for each question (both the questionnaires) in both the groups.

Denture quality score for both groups (intra-group comparison) over a period of 12 months (T0, T1, and T2) were statistically analyzed by using non parametric test i.e. Mann Whitney U test for intergroup comparison and Friedman test for intra group comparison.

RESULTS

Masticatory efficiency scores

Inter-group analysis for individual question of masticatory efficiency questionnaire (Table 1) showed that at baseline (T0), there was significant differences ($p<0.05$) in scores for all questions with better scores for Group B which showed patient satisfaction in patients with soft liner.

At 6 month interval (T1), although mean satisfaction scores for Group B were higher than Group A, statistically significant difference was seen only for some questions (Q5, Q6, Q7, Q8, and Q9). It could be inferred that in response to satisfaction with eating habits, chewing difficulty with any particular type of food, and being embarrassed with eating food with others, both the groups had similar experience.

At 12 month (T2) interval, again, the scores were higher for Group B but statistically significant difference ($p<0.05$) was only seen in response to questions concerned with stability of dentures on eating sticky food, difficulty with denture between meals, force needed to swallow, need for special food preparation and time taken to eat food. Satisfaction scales were better for patients with soft liner for these questions.

Intra-group comparison (Table 1) showed that for Group A, there was statistically significant difference ($p<0.05$) in scores for most questions over a period of time from baseline to 6 months to 12 months with overall improvement in scores.

For Group B, scores for most of the questions had no significant difference (p>0.05) over time indicating patient's response to masticatory efficiency with soft liner denture remains similar over a period of time except for two questions pertaining to satisfaction with eating habits as well as change on chewing with artificial teeth compared to natural teeth. Scores for both the question improved over time.

Patient's general satisfaction scores

Inter-group comparison for each question's score of general patient satisfaction questionnaire at all the three intervals (T0, T1, T2) showed that there was no significant difference (p>0.05) which means similar satisfaction levels between both groups (Table 2).

Intra-group comparison (Table 2) for Group A at three intervals showed no significant difference except question regarding comfort of lower denture. Comfort with lower conventional denture in Group A improved with time from 0- 6 months and remained same from 6-12 months. Intra-group comparison (Table 2) for Group B at three intervals showed no significant difference except question regarding chewing food well with denture. Patients in Group B showed improved satisfaction with chewing food with denture at 6 months compared to baseline.

Subjective evaluation of denture quality

The mean score of denture quality for all the parameters decreased in both the groups with time; while a significant decrease was found for mandibular denture retention and tissue support only (Table 3). Inter group comparison for denture quality showed Group B patients had significantly higher mandibular denture retention (at 6 and 12 month periods only) and better lower tissue condition at all the time intervals as compared to group A.

Table 1: Intra-group and inter-group comparison of mean score for each question of masticatory efficiency questionnaires at three intervals.

	Question	Group A p value (Intra-group)	Group B p value (Intra-group)	T0 (A)	T0 (B)	P value	T1 (A)	T1 (B)	P value	T2 (A)	T2 (B)	P value
Q1	Is there any change on chewing with the artificial teeth compared with your natural teeth; is it better now?	0.00*	0.007*	2.42 ± 0.51	3.35 ± 0.49	0.001*	3.21 ± 0.57	3.71 ± 0.46	0.064	3.21 ± 0.57	3.78 ± 0.42	0.026 *
Q2	Are you satisfied with the eating habits with the artificial teeth?	0.008*	0.019*	2.71 ± 0.46	3.28 ± 0.61	0.030*	3.14 ± 0.66	3.57 ± 0.51	0.164	3.14 ± 0.66	3.64 ± 0.49	0.099
Q3	Are you feeling conscious while having meals with the denture?	0.00*	0.082	2.57 ± 0.64	3.42 ± 0.51	0.011*	3.21 ± 0.57	3.64 ± 0.49	0.131	3.21 ± 0.57	3.64 ± 0.49	0.131
Q4	Is there any difficulty in chewing any type of food with artificial teeth?	0.008*	0.336	2.42 ± 0.64	3.28 ± 0.46	0.009*	2.85 ± 0.66	3.35 ± 0.49	0.069	2.85 ± 0.66	3.35 ± 0.49	0.069
Q5	Is there a need for special food preparation for you to make chewing food easier? [e.g. moistening, pureeing, cutting into small parts etc.]	0.010*	0.336	2.42 ± 0.66	3.28 ± 0.46	0.009*	2.78 ± 0.57	3.35 ± 0.49	0.036 *	2.92 ± 0.47	3.35 ± 0.49	0.088
Q6	How stable is your denture on eating sticky food?	0.015*	0.233	2.14 ± 0.66	3.42 ± 0.64	0.002*	2.57 ± 0.64	3.50 ± 0.65	0.007 *	2.57 ± 0.85	3.57 ± 0.64	0.028 *
Q7	Is there any force needed to swallow the food?	0.070	0.336	2.78 ± 0.57	3.42 ± 0.64	0.032*	2.85 ± 0.66	3.50 ± 0.65	0.048 *	3.07 ± 0.61	3.50 ± 0.65	0.153
Q8	Have you ever faced any difficulty with the denture between meals?	0.869	0.233	2.85 ± 0.66	3.50 ± 0.51	0.033*	2.92 ± 0.73	3.57 ± 0.51	0.042 *	2.85 ± 0.66	3.64 ± 0.49	0.010 *
Q9	Compared with others, do you feel you take a longer time for chewing food?	0.021*	0.446	2.35 ± 0.49	3.28 ± 0.46	0.001*	2.71 ± 0.72	3.35 ± 0.49	0.019 *	2.78 ± 0.69	3.42 ± 0.51	0.029 *
Q10	Are you embarrassed on having food with others?	0.155	0.336	2.71 ± 0.46	3.42 ± 0.51	0.006*	3.00 ± 0.55	3.50 ± 0.51	0.070	2.85 ± 0.66	3.50 ± 0.51	0.033 *

T0: Baseline, T1: 6 months, T2: 12 months, * Significant

Table 2: Intra- and inter-group comparison of mean score for each question of patients' general satisfaction questionnaire at three intervals

	Question	p value (Intra-group)		T0	T0	P value	T1	T1	P value	T2	T2	P value
		Group A	Group B	Group A	Group B		Group A	Group B		Group A	Group B	
Q1	Are you satisfied with the appearance of your denture?	0.999	0.999	4.07 ± 0.73	4.14 ± 0.53	0.433	4.07 ± 0.73	4.14 ± 0.53	0.433	4.07 ± 0.73	4.14 ± 0.53	0.433
Q2	Does your upper denture stay in place?	0.999	0.999	3.92 ± 0.82	4.00 ± 0.78	0.904	3.92 ± 0.82	4.00 ± 0.78	0.904	3.92 ± 0.82	4.00 ± 0.78	0.904
Q3	Does your lower denture stay in place?	0.999	0.999	3.14 ± 0.86	3.64 ± 0.92	0.528	3.14 ± 0.86	3.64 ± 0.92	0.528	3.14 ± 0.86	3.64 ± 0.92	0.528
Q4	Can you chew your food well with your dentures?	0.336	0.003*	3.21 ± 0.97	4.00 ± 0.78	0.117	3.28 ± 0.91	4.71 ± 0.46	0.001 *	3.28 ± 0.91	4.00 ± 0.78	0.172
Q5	Are you satisfied with how well you speak with your dentures	0.999	0.999	3.42 ± 0.85	4.28 ± 0.61	0.055	3.42 ± 0.85	4.28 ± 0.61	0.055	3.42 ± 0.85	4.28 ± 0.61	0.055
Q6	Is your upper denture is comfortable?	0.103	0.165	4.50 ± 0.65	4.78 ± 0.42	0.373	4.70 ± 0.46	4.90 ± 0.26	0.326	4.70 ± 0.46	4.90 ± 0.26	0.326
Q7	Is your lower denture is comfortable?	0.040*	0.999	3.64 ± 0.84	4.07 ± 0.82	0.311	3.92 ± 0.73	4.07 ± 0.82	0.659	3.92 ± 0.73	4.07 ± 0.82	0.659

T0: Baseline, T1: 6 months, T2: 12 months
* Significant

Table 3: Inter- and intra-group comparison of denture quality for different parameters.

	Group 1 (Mean ± SD)	Group 2 (Mean ± SD)	*Inter-group* P value*
Centric			
Baseline	3.86 ± 0.36	3.93± 0.27	0.549
6 months	3.86 ±0.36	3.93 ±0.27	0.549
12 months	3.71 ±0.47	3.79 ±0.43	0.668
Intra-group P value#	0.135	0.135	
Lower stability			
Baseline	3.71 ±0.47	3.86 ±0.36	0.366
6 months	3.57 ±0.43	3.75 ±0.38	0.244
12 months	3.50± 0.48	3.71 ±0.38	0.230
Intra-group P value#	0.074	0.174	
Lower retention			
Baseline	3.54 ±0.60	3.82 ±0.37	0.131
6 months	3.25 ±0.58	3.79 ±0.43	**0.011**
12 months	3.14 ±0.41	3.54± 0.41	**0.027**
Intra-group P value#	**0.002**	**0.012**	
Lower tissue condition			
Baseline	2.79 ±0.43	3.86 ±0.36	**0.000**
6 months	2.71 ±0.47	3.86 ±0.36	**0.000**
12 months	2.29 ±0.47	3.43 ±0.51	**0.000**
Intra-group P value#	**0.002**	**0.002**	

*Mann Whitney U test
#Freidman test

DISCUSSION

Results of the study revealed patients having RLL mandibular denture have better satisfaction with masticatory efficiency at one month after denture insertion. This can be explained by the reflex controlled by the sensory input from the mucosa, which may stop the closure of mandible to protect the underlying mucosa from excessive pressure and force. Patient wearing RLL mandibular denture, experienced less pain and ulcers on the ridge in initial phase of adjustment, therefore having longer occluding phase of masticatory cycle and could apply

more amount of force, as resilient liners due to their viscoelastic property absorb energy and prevent transmission of forces to the underlying tissues. Other different studies also showed better masticatory efficiency scores (objective evaluation) with RLL complete denture as compare to conventional complete denture.[14,16,17,18]

At 6 months, patients with RLL denture found their masticatory efficiency better than conventional group in few aspects like a need for special food preparation, better stability of denture on eating sticky food, force needed to swallow the food, difficulty with the denture between meals, and time taken for chewing food. For remaining questions, satisfaction level was similar. Previous studies too showed patients with RLL denture have longer occluding phase, can apply more force to chew the food and have better retention and stability.[14,17] At 12 months, patients showed further improvement in masticatory efficiency. This may be due to the development of skills to use the denture and adaptation of the denture with the surrounding tissues.[17]

Comparison of masticatory efficiency scores within the group, over a period of time, revealed that patients wearing conventional dentures showed overall improvement in scores for most questions over a period of 12 months, while patients with RLL dentures showed almost no change in masticatory efficiency with time. This indicates patients having denture without resilient liner require longer adaptation period as compare to those with RLL dentures.

Individual question analysis for general patient satisfaction showed that patients with RLL denture have significant difference only for question relating to chewing ability and comfort. While with regard to esthetics, speaking, and retention of denture, patients of both group had similar experience. This may be due to the cushioning effect that RLL patients experience, leading to less pain and discomfort during the adaptation phase.[14,16,18]

Results of the current study for denture quality showed retention of mandibular denture decreases with time in both the groups but significantly more reduction in controlled group. Similarly, condition of supporting tissues was significantly affected with time in both the groups but it was affected more for control group. These changes may be due to time dependent residual ridge resorption, wearing of teeth and warpage of denture material.[22,23] Fewer changes in RLL denture may be due to their viscoelastic nature- less forces are transmitted uniformly to the underlying hard and soft tissues therefore lead to less changes in underlying supporting tissues.[24,25]

CONCLUSION

In conclusion, patients wearing dentures with soft liner were more satisfied with the masticatory efficiency achieved than patients wearing conventional complete denture. In regard to general satisfaction with dentures (esthetics, speaking, comfort, retention) both groups' patients had similar experience. Chewing ability was better in resilient liner patients. Denture quality was better in resilient liner group and decreased in both groups with time. Based on the results obtained, further research on a wider representative population needs to be established.

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