

Comparing the Effect of Different Denture Adhesive form on Bite Force of Complete Denture Patients by Using Bite Force Pressure Indicator Machine: A Clinical Study

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ABSTRACT

Aim: The purpose of this study was to evaluate the effect of the use of 2 different denture adhesives forms (cream and powder) on the bite force of conventional complete denture patients.

Materials and Method: The selection of twenty patients was done based on them having maxillary and mandibular complete denture. Once the denture adhesives were used, the forces were measured using bite force pressure indicator machine. In this study, Fixon (powder) and Fixon (cream) were used as two different types of adhesives.

Results: The results suggest that denture adhesives improved the bite force of denture wearers. The mean force without adhesive is 0.471 grams, with Adhesive Fixon powder is 0.635 grams and with Adhesive Fixon cream is 0.643 grams.

Conclusion: Within limitations of the study, it was concluded that the use of denture adhesives was found to be significantly effective to improve bite force. Fixon cream is more effective compared to Fixon powder.

Keywords: Denture adhesive, bite force, prosthodontics.

INTRODUCTION

Complete denture is one of the most challenging task in Prosthodontics for treatment of completely edentulous patients. Retention, stability, support are the key factors for the success of complete denture. In clinical situations like old age, severe residual ridge resorption, patients with severe immunocompromised and poor economic status, the first line of treatment is the with conventional complete dentures rather than availability of recent advances like tooth and implant supported overdenture.

The biomechanical problems of complete denture that may be due to improper diagnosis, poor designing of the prosthesis or inadequate execution of treatment. Such situations can be overcome by providing a new prosthesis and despite all the proper prosthodontic treatment planned for the patient, poor outcomes can occur and we need to have alternatives to overcome these results.

Main goal of edentulous patients to receive complete denture is to improve mastication, so in compromised complete denture wearer patients, denture adhesives are used as an alternative.

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Denture adhesives are available in various forms like powder, cream, and sprays. Bite force is one of the method to check mastication.

Retention of denture helps in determining the bite force that can be exerted by complete dentures. Some of the factors, which are considered responsible for retention are adhesion, cohesion, inter-facial surface tension and capillary attraction. Denture adhesives has an additive effects on bite force and improves masticatory efficiency. Hence, bite force was evaluated with the use of denture adhesives.

Bonding agent is the main component of any denture adhesive. Most denture adhesives have carboxymethylcellulose composition, which consists of carboxylic group of natural origin. This component in denture adhesive, when comes in contact with the saliva, creates cohesion between the oral mucosa and the denture base. The composition differences in various denture adhesives is basically the synthetic adhesion agent used. Its role is to increase the property of natural adhesive agents, thereby increasing the life of adhesives. Based on the principle of adhesion and cohesion, its mechanism of action is by forming polymers that adhere their surfaces to each other. Some non- bonding synthetic agents like polyvinyl acetate, the copolymer of vinyl methyl ether or the maleic anhydride, they are responsible for formation of cross links or anions, in presence of saliva or water.

MATERIALS AND METHOD

For the present study twenty patients were selected randomly with class 1 jaw relationship who reported to Prosthodontics department of Karnavati School of Dentistry for the treatment regarding completely edentulous patients. Patients selected for the study were from age group between 50-70 years. All the patients had experience of wearing complete denture and they were receptive.

All patients were divided into three groups broadly. Group A (control group) without application of adhesive, Group B was in which Denture adhesive applied in cream form, and Group C is in which Denture Adhesive was applied in powder form.

All these patients were using Maxillary and Mandibular complete dentures and were very well adapted to their dentures.

Materials and armamentariums used in this study are, maxillary and mandibular complete denture set, bite force transducer **, self-cure acrylic block (20 mm x 6 mm x16 mm), fixon powder (ICPA Health Products Ltd, India), fixon cream (ICPA Health Products Ltd, India) disinfectant solution.

**The bite force transducer was a specially designed and constructed strain gauge scale. This weighing Indicator model-SMIT-3016 is based on popular 8-bit micro controller. Resistance to bite force exerted on the prongs of the device was converted into kilogram load. Its high precision load cell and its electronic circuit for indicating force provide precise measurements that are easy to read from its digital liquid crystal display. The weight Indicator is packed in 96mm x 48 mm Panel Mountable Plastic Enclosure. Weight Indicator generates the Output current 4mA – 20mA proportional to displayed weight using following equations:

$$\text{Output Current} = (\text{Actual Weight} * 16 / \text{FS Weight}) + 4 \text{ mA}$$

Method

Each patient was seated comfortably with head rest support on the dental chair. All patients were checked without adhesive and with adhesive cream and powder. The prongs of the dynamometer were disinfected with aldehyde free alcohol based surface disinfectant (Bacillol). An acrylic block 20 mm x 6 mm x16 mm was used as a bite block on the side opposite to bite force evaluation. The bite block was autoclaved between subjects. A practice session was included to familiarize the subject with the procedure of bite force. The patient was instructed to bite on the end of the prongs and asked to bite with maximal force in the best biting position that is when it was felt to be most comfortable to bite as hard as possible the prongs of the dynamometer were positioned in the mandibular first molar region. This procedure was done 3 times on each side with 1 minute interval between measurements to avoid muscular fatigue. The mean of right and left side values was recorded as mean bite force (MBF) for each type of denture and tabulated in Table 1. (Figure 1)



Fig 1: Adhesive powder applied on intaglio surface

Group B (adhesive cream) was applied to the intaglio surface of the complete dentures, after washing them thoroughly under running water. Once the dentures were reinserted with the application of adhesive cream, 15 minutes were allowed to pass until the test was undertaken.(Figure 2)



Fig 2: Adhesive cream applied on intaglio surface

Similar technique was followed by the application of group C (denture adhesive in powder form) The mean bite force values thus obtained for each group and were subjected to statistical analysis.

RESULTS

Table 1: Comparison of bite force values in three different groups.

Sr no.	GROUP A Control group (grams) Without adhesive	GROUP B With (adhesive powder) Fixon powder (grams)	GROUP C With adhesive cream Fixon cream (grams)
1	0.235	0.287	0.188
2	0.615	0.865	0.554
3	0.61	1.075	1.118
4	0.352	0.517	0.618
5	0.186	0.364	0.581
6	0.412	0.782	0.958
7	0.68	0.622	0.695
8	0.451	0.609	0.865
9	0.109	0.362	0.697
10	0.496	0.755	0.937
11	0.431	0.496	0.547
12	1.46	1.849	2.199
13	0.534	1.151	1.584
14	0.319	0.596	0.669
15	0.535	0.748	0.961
16	0.216	0.643	0.907
17	0.366	0.59	0.854
18	0.412	0.762	0.940
19	0.110	0.350	0.670
20	0.467	0.690	0.750

STASTICAL ANAYLISIS:

Here, for stastical analysis paired t test was applied between two groups and the results were significant between groups.

Table 2: Comparative representation of means and standard deviation of bite force of different groups with different adhesives applied on intaglio surface of dentures.

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Group B	.72418	20	.371392	.090076
	Group A	.47100	20	.301798	.073197
Pair 2	Group C	.87835	20	.452480	.109742
	Group A	.47100	20	.301798	.073197

Table 3: Correlation between different groups

		N	Correlation	Sig.
Pair 1	Group C & Group A	20	.900	.000
Pair 2	Group B & Group A	20	.772	.000

Table 4: Comparative representation of means and standard deviation of bite force and standard error of mean with confidence interval of different groups with different adhesives applied on intaglio surface of dentures.

		Paired Differences					T	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1		.253176	0.165420	.040120	.168125	.338228	6.310	16	.000
Powder Control									
Pair 2		.407353	0.291708	.070750	.257371	.557335	5.758	16	.000
Cream Control	–	0.154176							
			0.178787	0.043362	0.062253	0.246100	3.556	16	0.003
Pair 3									
Cream Powder									

RESULTS

Total 20 patients were selected for the study and were divided into three groups (Group A, Group B, Group C). The mean biting force was recorded for each and every patient in all the groups shown in Table 1.

These collected data was analyzed stastically using SPSS software version and mean, standard deviation, paired correlation was calculated as shown in Table 2. The mean value of bite force for Group A was 0.471, Group B was 0.667, and Group C was 0.637. Intergroup comparisons was done to see the paired correlation between group C and A, B and A, B and C. The results were stastically significant between group A and C, B and C. So it shows that group C is significant compared to all three groups.

DISCUSSION

The denture adhesives are used to improve fit, comfort, mastication and confidence of patient. Denture adhesives hold the dentures securely and comfortably all the day long and provide satisfaction to the patients. Denture adhesives are supplied as a paste, powder and cream form. As the Adhesive powder absorbs water, they swell to many times their original volume and the anions so formed, interact with cations in the proteins in the oral mucous membrane. The viscosity of the adhesive is increased by the thick saliva formed, thereby increasing denture retention.

Denture adhesive in cream form provide more viscosity which results in lateral spread excluding air and saliva thereby increasing retention. Fixon cream contain white petrolatum, aerosol, light petrolatum, gantraz, and cellulose gum and carboxy methyl cellulose. The results concluded from this study are that the biting forces are increased on the application of denture adhesive to the complete denture. The application of adhesive lead to improved mastication, providing greater confidence and increased comfort. These results were accredited to the mechanism of action of adhesive, which increased the viscosity of saliva between oral mucosa and denture base, thereby optimizing the properties of adhesion and cohesion. This lead to increased retention, stability and bite force in denture.

The results show significance correlation for the control group and the group which uses adhesive in two different forms. Here in this study Table 1 shows significant results between three different groups and also in table 2 shows paired test between groups. Table 4 suggest that there is a significant difference between group 1 and group 2 and group 1 and group 3. Similarly **Pawan kalra et al¹**, all found in study that denture adhesives improved the incisal bite force of complete denture wearer patients significantly.

A stastically significant correlation was found between group A and B. These results are in favor of study done by **Pawar et al** who finally concluded in their study.

Cream form of adhesive gives better bite force compared to powder form, as cream is slightly viscous in nature so it can also work better whereas for powders we have to wet the dentures after sprinkling a powder in thin section. Patients feel more confident with the use of cream form of adhesives as compared to powders.

CONCLUSION

Thus to conclude with the study, the biting force of complete dentures was increased with the use of adhesives. And among the three groups, the highest biting force was encountered with the application of adhesive cream followed by powder.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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