

The Effect of Use Denture Adhesive Powder and Cream on Masticatory Efficiency in Full Denture User at University of Sumatera Utara Dental Hospital

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Abstract:

Background : The use of complete denture in edentulous patients aims to restore masticatory function. Prolonged use results in loose dentures, so denture adhesive is used while waiting for the creation of new dentures. Denture adhesive is a material used to attach dentures and oral tissue. This material is more often used in preparations for creams and powders because it is more easily found on the market. Denture adhesive cream preparations last longer when used and support mastication compared to powder preparations. This study aims to determine the effect of the use of denture adhesive powder and cream on the efficiency of mastication in denture users.

Materials and Methods : The design of this study was true experimental with the post test only control group design, which consisted of 10 samples and there were 3 treatment groups in this study with the same number of samples. For the use of dentures without denture adhesive, patients are instructed to chew gum that has been provided for 30 seconds with normal chewing and then the gum is placed in a container that has been provided, while for the use of dentures with denture adhesive, the denture adhesive material powder and cream on the denture before it is placed in the oral cavity and the patient is instructed to chew gum.

Results : The largest mean value was found in the denture adhesive cream group which indicated the efficiency of patients using denture adhesive cream was better than the groups without denture adhesive and denture adhesive powder but statistically showed no effect on the use of denture adhesive cream and powder on the efficiency of mastication. ($p > 0,05$)

Conclusion : Denture adhesive cream is recommended for use in cases that require denture adhesive, to increase the efficiency of mastication.

Keywords : Complete Denture, Denture Adhesive Powder, Denture Adhesive Cream, masticatory efficiency.

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I. Introduction

Edentulus can be treated by making complete dentures.¹ Full dentures are made to replace lost teeth and their supporting tissue, a combination of art and science to correct tooth loss.² The aim of treatment with complete dentures is to restore the function of the teeth that is, aesthetically, functionally and maintaining general health.¹ The process of making complete denture through a long procedure to the stage of denture placement, which needs to be considered at the stage of denture placement is retention, stabilization, occlusion and aesthetics. Then the education stage is carried out to find out how to use and clean dentures.^{1,3} Periodic visits after the placement of dentures are needed to determine the condition of dentures and occlusion patients. The first periodic visit is 24 hours after placement to check for disharmony occlusion and reaction of new dentures to the tissue, then one week after placement of dentures. The next periodic visit is 3-6 months and a year after the placement of complete denture.⁴ Complaints that can be felt by patients due to the use of complete denture such as whistling, earache, difficulty swallowing, food scraps attached to artificial teeth, loss of sensation of taste, halitosis, and completed denture dislodgement caused by physiological resorption of alveolar bone that affects denture retention and stabilization.^{3,4} Poor retention and stabilization will affect the efficiency of mastication because it is caused by the distribution of forces that affect the denture when chewing.⁵ Devlin and Ferguson (1991) (cited from Karolina et al. 2010) full dentures aren't in the alveolar ridge like natural teeth, resulting in non-physiological pressure on the surface of the jawbone, which is the reason for increased resorption in the alveolar bone so that it will affect the retention and stabilization of dentures.⁶

Denture adhesive can be used as a solution for retention complete denture problems, denture adhesive is a material to attach denture to the oral mucosa.⁴ denture adhesive can increase the retention of denture and make comfortably fell user, the ingredients contained in denture adhesive consist of three groups : adhesive ingredients (tragacanth, gelatin and active polymer materials), antimicrobial materials and other materials such as plasticizing agents, flavoring agents such as peppermint oil, oil of wintergreen, and wetting agent.⁷ Denture

adhesive available in the form of pasta, cream, powder, strips, and cushions, but in general the type of denture adhesive used is a cream and powder because it is easily available on the market.¹ Denture adhesive cream is more durable when used and supports mastication compared to powder because of the ingredients in the cream there are CMC (Carboxymethylcellulose) and PVM-MA (polyvinylether methyl cellulose) while the powder ingredients are a combination of CMC and PVM-MA.

De Oliviera et al (2014) denture adhesive can improve the efficiency of mastication in denture users.⁸ Mastication efficiency is the ability of individuals to break down food in a certain time that can be evaluated.⁹ The methods for evaluating mastication efficiency are sieves system, colorimetric method, subjective assessment, image analysis, B-carotene-containing gummy jelly, and chewing gum. Chewing gum is the best method evaluation for elder people to evaluate efficiency mastication¹⁰ Tsubakida K et al (2017) that more people choose denture adhesive because it greatly increases stability and is more retentive when used so that patients feel comfortable.¹¹ Hasegawa et al (2003) suggested that denture adhesive contributes to reducing the movement of dentures and supports the function of mastication.¹² Tarib et al (2010) that DA supports mastication in denture users.¹³ Shamsolketabi et al (2018) stated that the use of denture adhesive supports mastication in denture users with different teeth.¹⁴ According to Jian-min han et al (2010) cream types are more effective than powder because they have low initial viscosity and high adhesive strength and advise dentists to use denture adhesive cream.¹⁵ M Farzin et al (2017) the use of denture adhesive increases patient satisfaction Denture wearers were compared without using denture adhesive, and showed satisfaction of denture wearers using cream was greater than those using powder.¹⁶ Sayali A. Thakare et al (2016) that there was no difference in the mastication efficiency of denture wearers using DA and powder preparations. cream.¹⁷ Based these difference of opinion, becomes a consideration for the authors to conduct research on the effect of the use of denture adhesive powder and cream on the efficiency of mastication in full denture users

II. Material and Method

This is an true experimental research with posttest only control group design, the population in this study were patients at the Dental Hospital in University of Sumatera Utara. The sample of this study were patients treated by making complete dentures at the Prosthodontics Clinic who have fulfilled the inclusion and exclusion criteria. Sample was done by purposive sampling technique. Purposive sampling is one technique in determining samples that uses certain considerations and characteristics in choosing a sample. Total sample is 10 patients and carried out three times so that the treatment becomes three groups. Inclusion Criteria; Patients treated with complete denture at dental hospital university of Sumatera utara, willing to follow the research procedures, patients aged 45-70 years, the minimum duration of use of complete is 3 months. Exclusion Criteria; Patients suffering from xerostomia, patients who are allergic to zinc, patients with maxillofacial abnormalities, there is a hyperplastic network that disrupts the denture bearing area, temporomandibular disorders are present. The sample examination site was conducted at the prostodontics clinic in dental hospital university of Sumatera utara and for the measurement of gum chewing weight after being chewed at the biokimialaborator in university of Sumatera utara. this research was conducted in May-July 2019.

Procedure methodology :

1. Without Denture Adhesive

Subjects were first seated on a chair that was prepared and then written informed consent was obtained, the patient is instructed to chew the gum that has been provided for 30 seconds, then the subject is asked to take out the chewed gum into the container provided. Give the subject mineral water and instruct the patient to rinse.

2. Denture Adhesive Powder

Subjects were first seated on a chair that was prepared and then written informed consent was obtained, make sure the surface of Intaglio is clean by means of the denture soaked with denture cleaning agents, denture adhesive powder is sprinkled throughout the intaglio surface of the maxillary and mandibular dentures which are moist. then the denture is placed back into the patient's oral cavity, Subjects were instructed to chew gum for 30 seconds, 15 minutes after the complete denture was placement, then the subject is asked to take out the chewed gum into the container provided. Give the subject mineral water and instruct the patient to rinse.

3. Denture Adhesive Cream

Subjects were first seated on a chair that was prepared and then written informed consent was obtained, make sure the surface of Intaglio is clean by means of the denture soaked with denture cleaning agents, after drying the denture adhesive cream was applied in the form of lines on the intaglio surface of the maxilla two in the posterior, 1 in the anterior and 1 in the hard palate. on the surface of the mandible intaglio was applied in the form of a longitudinal line. Then the denture is placed back into the patient's oral cavity, Subjects were instructed to chew gum for 30 seconds, 15 minutes after the complete denture was placement, then the subject is asked to take out the chewed gum into the container provided. Give the subject mineral water and instruct the patient to rinse.

4. Sample Testing

Chewing gum is then washed in running water, then dry the chewed gum with absorbent paper, Put the chewed gum in the desiccator for about 72 hours. After 72 hours the gum is removed weight using digital scales. Compare the weight before and after chewing gum, the smaller the weight of chewing gum, the better the efficiency of chewing.

III. Result

Table 1. Masticatory Efficiency of Patients Using Complete Dentures without Using Denture Adhesive, by using Denture Adhesive Powder, and Denture Adhesive Cream at the University of Sumatera Utara Dental Hospital

The measurement of chewing efficiency is done using the method of chewing gum with gum as an evaluation material by measuring the weight of gum after chewing by the patient then calculating the percentage of weight lost due to sugar levels that have been swallowed by the subject. Based on the results of data collection on 10 patients with 3 treatments obtained mastication efficiency values. The biggest chewing efficiency in the group without denture adhesive (group A) was 30.96% and the smallest chewing efficiency was 13.52%. The largest mastication efficiency in the powder group (group B) was 32.30% and the smallest mastication efficiency was 16.72%. The largest mastication efficiency in the cream group (group C) was 40.21% and the smallest mastication efficiency was 20.28%.

The mean value of mastication efficiency was analyzed by Univariate test. The mean value of mastication efficiency in the group without using denture adhesive was 22.87% with a standard deviation of 5.47%. The mean value of mastication efficiency in the powder group was 24.75% gram with a standard deviation of 5.65%. The average mastication efficiency in the cream group was 28.56% with a standard deviation of 6.71%

Tabel 1 Masticatory Efficiency of Patients Using Complete Dentures without Using Denture Adhesive, by using Denture Adhesive Powder, and Denture Adhesive Cream

No Sample	Masticatory Efficiency (%)			Time of use Complete Denture (Month)
	Without Denture Adhesive (Group A)	Denture Adhesive Powder (group B)	Denture Adhesive Cream (group C)	
1.	28,82	29,18	37,72	<6
2.	30,96**	32,02	32,38	<6
3.	29,18	32,30**	40,21**	6-12
4.	20,64	23,13	25,26	6-12
5.	24,55	28,82	31,67	6-12
6.	19,57	22,06	23,89	>18-24
7.	20,28	16,72*	20,28*	>18-24
8.	13,52*	17,79	23,48	>18-24
9.	18,86	24,19	28,11	>18-24
10.	22,41	22,17	23,13	>18-24
X±SD	x = 22,87 sd = 5,47	x = 24,75 SD = 5,65	x = 28,56 SD = 6,71	

Keterangan : * : the smallest
** : the biggest

Table 2. The Effect of Use of Denture Adhesive Powder on masticatory efficiency in Complete Denture Users at the University of Sumatera Utara Dental Hospital

To evaluate the effect of the use of a denture adhesive powder on the efficiency of mastication, it was analyzed by using an independent t-test. Based on the Independent t-test that has been done, it can be seen that there is no effect of the use of denture adhesive powder on the efficiency of mastication with a value of p = 0.460 (p> 0.05). (Table 2)

Table 2. Effect of use of denture adhesive powder on masticatory efficiency.

NO	Group	n	$\bar{X} \pm SD$	Mean Difference	p
1.	Without Denture Adhesive	10	22,87 ± 5,47	1,88	0,460
2.	Denture Adhesive Powder	10	24,75 ± 5,65		

Table 3. The Effect of Use of Denture Adhesive Cream on masticatory efficiency in Complete Denture Users at the Univrsity of Sumatera Utara Dental Hospital

To evaluate the effect of using denture adhesive cream on the efficiency of mastication analyzed by using the independent t-test, based on the results of the t-independent test it was seen that there was no effect of the use of denture adhesive cream on the efficiency of mastication with a value of $p = 0.053$ ($p > 0.05$). (Table 3)

Table 3. The Effect of Use of Denture Adhesive Cream on masticatory efficiency

NO	Group	n	X±SD	Mean Difference	p
1.	Without Denture Adhesive	10	22,87 ± 5,47	5,68	0,053
2.	Denture Adhesive Cream	10	28,56 ± 6,71		

IV. Disscusion

In the results of this research, mastication efficiency values varied in each group, the largest mastication efficiency value in the group without denture adhesive was 30.96% and the smallest mastication efficiency was 13.52%. The biggest mastication efficiency in the powder group is 32.30% and the smallest chewing efficiency is 16.72%. The biggest chewing efficiency in the cream group was 40.21% and the smallest chewing efficiency was 20.28%. This can be caused by several factors that affect the efficiency of mastication. Chewing pressure is one of the factors that influence the efficiency of mastication according to Black (cited from Nickolay 2014), the strength of mastication pressure of the original teeth is 390 kg and the bite strength is average 50-60kg, and in denture users the mastication pressure is reduced by 20-50%. According to Lim (cited from Bates JF 1975) the bite force on denture wearers is 3.9-27.2 kg. The low mastication pressure and bite strength affect the results of mastication efficiency in denture wearers. Varying the results of mastication efficiency in each group is likely due to gender differences within each group. According to Kotwal (cited from Bates JF 1975) there are differences in the strength of the bite between men and women. The results of Nickolay Apostolov's research (2014) also stated that there was a difference in the bite strength between men and women, so that there were differences in the results of mastication efficiency in subjects in one group. Chewing speed is also a factor that affects the efficiency of chewing according to Neill (cited from Bates JF 1975) the speed of chewing on every denture wearer is influenced by retention and stabilization of dentures. In denture wearers with poor retention and stabilization conditions, slower mastication can affect the efficiency of denture wear mastication. Shepherd (cited from Bates JF 1975) states the speed of chewing on denture users there is one mastication cycle every one second. In this study the subjects were instructed to chew for 30 seconds, the possibility of the number of chewing frequency of each subject during the evaluation time for 30 seconds was different due to differences in the use of dentures which affect the retention and stabilization of dentures so that the results of varying mastication results in subjects in each group.^{19,20}

The results of this study indicate the value of mastication efficiency in the three smallest groups found in subjects who have used dentures with a duration of use of more than 18-24 months, this is possible because of the use of dentures that have more than one and a half years there has been a resorption so causes changes in retention and stabilization that affect the efficiency of mastication. Research conducted by Kovaic et al (2011) shows that there is severe resorption in denture users both in the maxilla and mandible with a period of use of five years.²³ and the greatest value of mastication is found in subjects who have used dentures with a duration of use less than 6 months and 6-12 months, this is possible because the use of dentures is less than 6 months and 6-12 months has not occurred so severe alveolar bone resorption. According to Nalaswany et al (2003) in denture users with 3-6 months long denture usage, resorption has begun to occur so it has less effect on retention and stabilization. Occurrence of resorption in denture wearers is due to the absence of a balanced physiological process between osteoclasts and osteoblasts due to pressure transmission when chewing on natural teeth but in denture wearers is dominated by osteoclasts because dentures are attached to the acrylic resin base, then continuous use of dentures also causes alveolar bone resorption to become faster.^{6,18}

The mean value of mastication efficiency was analyzed by the Univariate test. The mean value of mastication in the group without D.A was 22.87% with a standard deviation of 5.47%. The mean value of mastication efficiency in the powder group was 24.75% gram with a standard deviation of 5.65%. The average mastication efficiency in the cream group was 28.56% with a standard deviation of 6.71%. The results of this research show that the efficiency of mastication group using denture adhesive cream is greater among the three groups which shows the best mastication efficiency. The results of this study are in line with research conducted by SayaliThakare (2016) who used the sieve method as a method of evaluating mastication efficiency in his research showing that in the cream group the value of mastication efficiency was better. This is due to the content of denture adhesive cream containing CMC (Carboxymethylcellulose) and PVM-MA (polyvinylethermethylcellulose). The combination of CMC and PVM-MA properties results in high initial strength and adhesive denture adhesive material and does not dissolve quickly and last a long time when used so that it can increase efficiency mastication.

Based on the results of the Independent T test showed no significant effect on the use of denture adhesive powder and cream on the efficiency of mastication in full denture users.

Whereas the results of this study showed no significant effect on the use of denture adhesive powder on full denture users on the efficiency of mastication and differed from the previous theory, although the average value of denture adhesive powder and cream was greater than without the use of denture adhesive. This shows the efficiency of mastication with a better denture adhesive but the effect is not significant, this is likely due to the number of samples that are too small so the lack of data obtained, then the subjects of this study patients dental hospital at university of Sumatera Utara with a time of use of 3-24 months, so that the placement the complete denture through strict procedures and supervision to achieve good retention and stabilization of dentures, so that at the time of this study the condition of the denture used was still good in terms of retention and stabilization so that it was still comfortable to use for chewing. In addition, the strength of the patient's masticatory pressure during chewing gum cannot be controlled because in each group there are differences in sex and bite strength so that it might affect the results of the mastication efficiency

V. Conclusion

Although there was no significant effect of denture adhesive powder and cream on the efficiency of mastication, the best value for mastication was in the group using denture adhesive cream so it was recommended that patients use denture adhesive cream to improve mastication efficiency.

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