

Original article

The Effect of Applying Adhesive Powder and Cream of Denture on Dentures Wearers' Masticatory Function

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Abstract

Background and aims. Edentulous can be treated by making complete dentures. Full dentures are made to replace lost teeth and their supporting tissue. The purpose of this study was to assess how adhesive powder and cream affect mastication efficiency in denture wearers. **Methods.** Patients with dentures without denture adhesive are instructed to chew gum that has been provided for half minutes with normal chewing and then place the gum in a container that has been provided, Patients with denture adhesive are told to apply denture adhesive material powder and cream to the denture before it is placed in the mouth, and then chew gum for half minute with regular chewing and then deposit the gum in a container supplied. **Results.** The patients who used adhesive cream of denture had the greatest mean value, suggesting that they had higher mastication efficiency than those who did not use denture adhesive or adhesive powder of denture. However, there was no statistic significant difference in mastication efficiency when adhesive cream and powder of denture were used. ($p>0,15$). **Conclusion.** Adhesive cream of denture is recommended for usage in instances when denture adhesive is required to improve mastication efficiency.

Keywords: Complete Denture, Adhesive Powder, Adhesive Cream, Masticatory, Retention.

Introduction

Edentulous can be treated by making complete dentures. Full dentures are made to replace lost teeth and their supporting tissue, a combination of art and science to correct tooth loss [1,2]. 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 creating a full denture involves a lengthy operation that culminates in denture installation. At this point, retention, stability, occlusion, and aesthetics must all be addressed. Periodic visits are required following the implantation of dentures to assess the condition of the 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]. Whistling, earache, difficulty swallowing, food scraps attached to artificial teeth, loss of taste, halitosis, and complete denture dislodging caused by physiological resorption of alveolar bone that affects denture retention and stabilization are some of the complaints that patients may experience as a result of wearing a complete denture [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]. Complete dentures aren't in the alveolar ridge like natural teeth, resulting in non-physiological load on the ridge of the jaw which is the cause for reduced in the height and width of alveolar bone so that it will affect the retention and stabilization of dentures [6].

Adhesive is a substance that is used to attach the full denture to the supporting tissues. It can also be used to improve full denture retention [4]. Denture adhesive has three categories of components: adhesive elements (tragacanth, gelatin, and active polymer materials), antimicrobial materials, and additional materials such as plasticizing agents, flavoring agents like peppermint oil, oil of wintergreen, and wetting agent [7]. Strips, cream, pasta, powder, and cushions are among the many types of adhesive available, however cream and powder are the most common because to their simplicity of use [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), PVM-MA (polyvinylether methyl cellulose) and the powder ingredients are a combination of CMC and PVM-MA.

Denture adhesive can help denture wearers masticate more effectively [8]. Mastication efficiency is a measurement of an individual's ability to break down food in a specific amount of time [9]. Sieves system, colorimetric technique, subjective assessment, picture analysis, B-carotene-containing gummy jelly, and chewing gum are all ways for measuring mastication efficiency. Chewing gum is the most effective way for elderly individuals to assess mastication effectiveness [10].

According to previous studies, more individuals are opting for denture adhesive since it improves stability and retentiveness when used to make patients feel more comfortable [11]. Another research discovered that the adhesive aids in the retention of dentures and improves mastication [12]. Denture adhesive aids mastication in denture wearers with a variety of teeth, according to the study [14]. Denture adhesive cream is more successful than powder because it has a lower initial viscosity and a higher adhesive strength, according to dentists [15].

According to Farzin et al. (2017), using denture adhesive improves patient satisfaction. Denture users were compared without using denture glue, and it was discovered that those who used cream were more satisfied than those who used powder [16]. Recent studies revealed no change in denture users' mastication efficiency while using denture adhesive vs powder preparations cream [17]. Based on these differences of opinion, the current study was aimed to assess the impact of denture adhesive powder and cream on the mastication efficiency of full denture wearers.

Methods

Study design and Sampling

This is a genuine experimental study with just a post-test control group. The participants in this study were patients at the removable prosthodontic department in Faculty of Dentistry. Patients treated with full dentures at the detachable prosthodontic department who met the inclusion and exclusion criteria made up the study's sample. Purposive sampling was used to collect the data. Purposive sampling is a strategy for selecting samples that takes into account specific factors and features. The total sample size is eight patients, and the procedure is repeated three times, resulting in three treatment groups.

Patient selection

The inclusion criteria were patients who have had a complete denture fitted at a removable prosthodontic department and are willing to participate in the research, and were between the ages of 39 and 70 years old that the complete denture was worn for a minimum of three months. Patients with xerostomia, patients allergic to zinc, patients with maxillofacial anomalies, a hyperplastic network disrupting the denture-bearing area, and patients with TMJ problems are excluded.

Experiments

The gum chewing weight was measured at the detachable prosthodontic region during the sample inspection. Without adhesive for dentures, subjects were placed in a chair that had been prepared and directed to chew the gum given for half minute before removing the chewed gum and placing it in the container provided. Patients were asked to rinse with a water. Powder Adhesive for dentures the subjects were initially sat in a chair that had been provided, and the surface of the Intaglio was cleaned with a denture soaked in denture cleaning agents. Denture adhesive powder was then sprinkled throughout the intaglio surface of the wet maxillary and mandibular dentures. The denture was then reinserted into the patient's mouth. The patients were told to chew gum for half minute and then empty the chewed gum into the container supplied fifteen minutes after the full denture was fitted. Patients were asked to swirl water in their mouth.

Adhesive cream for dentures after the subjects were seated in a chair that had been prepared and the surface of the intaglio was cleaned with a denture soaked in denture cleaning agents, the denture adhesive cream was applied in the form of lines on the intaglio surface of the upper arch, two in the back, one in the front, and one in the hard palate.

On the surface of the lower arch, an intaglio in the form of a longitudinal line was applied. The patient's denture was then reinserted into his or her mouth. Fifteen minutes after the complete denture was placed, the subjects were instructed to chew gum for half a minute before removing it into the container supplied. The chewed gum is then washed a under running water and dried with absorbent paper. Place the chewed gum for four days in a desiccator. After four days, the gum was removed and weighed on automated scales. When comparing the weight before and after chewing gum, the chewing efficiency increases as the chewing gum weight decrease.

Statistical analysis

Data was analyzed using SPSS (IBM SPSS Statistics for Windows, Version 21.0). Frequencies and percentage were reported for categorical variables and means with standard deviations (SDs) were reported for continuous variables. The Chi-square test was used for the categorical variables and a P-value <0.05 was considered statistically significant.

Results

Chewing efficiency was highest in the group without adhesive of denture (group A) and lowest in the group with of adhesive denture (group B), as shown in table 1. In the powder group (B), the highest mastication efficiency was 29.2 percent, while the lowest mastication efficiency was 13.02 percent. The cream group (C) had the highest mastication efficiency of 37.11 percent and the lowest mastication efficiency of 17.18 percent.

The Univariate test was used to examine the mean value of mastication efficiency. The group that did not use denture adhesive had a mastication efficiency of 19.77 percent, with a standard deviation of = 2.37 percent. The mean mastication efficiency in the powder group was 21.65 percent gram, with a standard variation of 2.55 percent gram, with a standard deviation of 4.55 percent. The cream group's average mastication efficiency was 25.46 percent, with a standard deviation of 4.71 percent.

Table 1 Masticatory Efficiency of Patients Using Complete Dentures without Using Denture Adhesive (Denture Adhesive Powder, and Denture Adhesive Cream)

Sample NO	Masticatory Efficiency (%)		
	Without Denture Adhesive (Group A)	Denture Adhesive Powder (group B)	Denture Adhesive Cream (group C)
1	25.72	26.08	34.62
2	<u>30.96</u>	28.98	29.28
3	26.08	<u>29.20</u>	<u>37.11</u>
4	17.55	20.03	22.16
5	21.45	<u>25.72</u>	28.57
6	16.47	18.96	20.79
7	17.42	<u>13.02</u>	<u>17.18</u>
8	<u>10.42</u>	14.69	20.38
X±SD	X = 19.77 SD = 2.37	X = 21.65 SD = 2.55	X = 25.46 SD = 4.71

The effect of using adhesive powder of denture on mastication efficiency was evaluated using an independent t-test. With a value of p = 0.63, it is apparent that using denture adhesive powder has no effect on mastication efficiency, according to the findings of the independent t-test. As showed in Table 2.

Table 2. Masticatory efficiency and the usage of denture adhesive powder

NO	Group (A)	X±SD	P Value
8	Without Denture Adhesive	X = 19.77 SD = 2.37	0.63
8	Denture Adhesive powder	X = 21.65 SD = 2.55	

The effect of using adhesive cream of on mastication efficiency was evaluated using the independent t-test. Based on the findings of the t-independent test, it was determined that there was no effect of using denture adhesive cream on mastication efficiency with a value of p = 0. 56. As appear in Table 3.

Table 3. Masticatory efficiency and the usage of Denture Adhesive Cream

NO	Group (B)	X±SD	P – Vale
8	Without Denture Adhesive	X = 19.77 SD = 2.37	0. 56.
8	Denture Adhesive Cream	X = 25.46 SD = 4.71	

Discussion

Masticatory efficiency values differed between groups in this study; the group without denture adhesive had the highest mastication efficiency of 27.86 percent, while the group with denture adhesive had the lowest mastication efficiency of 10.42 percent. The powder group had the highest mastication efficiency of 29.20 percent and the lowest chewing efficiency of 13.02 percent. The cream group had the highest chewing efficiency of 37.11 percent and the lowest chewing efficiency of 17.18 percent. A multitude of factors that affect mastication efficiency can produce this. Chewing pressure is one of the variables that influences the effectiveness of mastication; the original teeth have a mastication pressure of 390 kg, and the bite strength is typical 50-60 kg, and denture wearers have a mastication pressure of 20-50 percent lower. Denture wearers have a biting force of 3.9-27.2 kg [19]. Mastication effectiveness in denture users is influenced by low mastication pressure and biting strength the gender inequalities within each group are most likely to blame for the disparities in mastication efficiency findings. The strength of a man's bite differs from that of a woman's bite. According to Apostolov's research [20], there was a variation in bite strength between men and women, resulting in disparities in mastication efficiency findings in participants in one group. Chewing speed is another element that influences chewing efficiency. Denture stability and retention affect chewing speed in every denture user.

In denture wearers with poor retention and stability, slower mastication can reduce the efficacy of denture wear mastic. The speed of chewing on denture users there is one mastication cycle every one second [19]. However, owing to variations in the usage of dentures, the number of chewing frequency of each subject throughout the assessment period for half minute might be varied which affect the retention and stabilization of dentures so that the results of varying mastication results in subjects in each group [19,20]. The findings of this study show that the value of mastication efficiency is highest in subjects who have worn dentures for more than 20-25 months. This was due to the fact that when dentures are worn for more than one and a half years, there is resorption, which causes changes in retention and stabilization, which affect mastication efficiency.

According to previous research, denture users have significant resorption in both the upper jaw and lower jaw after five years of usage. The highest mastication value is seen in participants who have worn dentures for less than 6 months and for 6 -12 months, respectively [23]. Resorption has begun in denture wearers who have had their dentures for 3-6 months, thus stability and retention are less affected. Denture wearers experience resorption because there isn't a balanced physiological process between osteoclasts and osteoblasts due to pressure transmission when chewing on natural teeth, but because dentures are attached to an acrylic resin base, osteoclasts dominate. As a result, continuous use of dentures accelerates alveolar bone resorption [4].

Univariate test was used to look at the mean value of mastication efficiency. Mastication rate was 19.77 percent in the group without denture adhesive, with a standard deviation of 2.37 percent. The mean mastication efficiency in the powder group was 21.65 percent gram, with a standard variation of 2.55 percent. Mastication efficiency in the cream group was 25.46 percent on average, with a standard deviation of 4.71 percent.

The findings of this study reveal that of the three groups with the best mastication efficiency, the mastication group utilizing denture adhesive cream had the highest efficiency. Recent studies that used the sieve method to measure mastication efficiency revealed that the cream group had a better mastication efficiency grade. This is due to the presence of CMC (Carboxymethylcellulose) and PVM-MA in denture adhesive cream (polyvinyl-ether-methylcellulose). When used to increase mastication efficiency, the combination of CMC and PVM-MA properties provides a denture adhesive material with high initial strength and adhesion that does not dissolve quickly and lasts a long time.

According to the findings of the independent t-test, the use of adhesive powder and adhesive cream had no significant effect on the efficacy of mastication in complete denture users. Despite the fact that the average value of adhesive powder and cream was larger than when denture adhesive was not used, the results of this study indicated no significant impact on mastication efficiency in full denture users, contradicting the previous notion. This shows the efficiency of mastication with a better denture adhesive, but the effect is not significant;

this is likely due to the small number of samples used, resulting in a lack of data. The subjects of this study were patients at the removable prosthodontic department with a time of use of 3-24 months, so that the complete denture was placed using strict procedures and supervision. Furthermore, because each group has variances in sex and bite strength, the intensity of the patient's masticatory pressure when chewing gum cannot be controlled, which may impact the mastication efficiency findings.

Conclusion

Although there was no significant difference in mastication efficiency between the groups using adhesive powder and cream, the group using adhesive cream of denture had the best mastication value, thus it was advised that patients use adhesive cream of denture to increase mastication.

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