Subjective Assessment by Patients of the Efficiency of Two Denture Adhesive Pastes

Yasemin Kulak, PhD;¹ Mutlu Özcan, PhD, DMD;² and Ayla Arikan, PhD¹

Purpose: This study evaluated the subjective responses of 30 denture wearers with regard to the effectiveness of two denture adhesive pastes.

<u>Materials and Methods</u>: Thirty patients responded to questions related to retention, chewing ability, taste, duration of adhesives in the mouth, and removal; comparing the use of two denture adhesives based on polymethylvinylether-maleic anhydride compounds or carboxymethyl cellulose.

<u>Results</u>: The denture adhesive paste based on polymethylvinylether-maleic anhydride (PVM-MA) compound was rated higher (73% and 87%) than carboxymethyl cellulose (CC) adhesive paste (60% and 37%) on chewing ability and duration in the mouth (p = 0.0001 and p = 0.0001, respectively) by experienced denture wearers in both maxilla and mandible. There were no statistically significant differences between the two denture adhesive pastes on the retention of maxillary dentures, taste, and removal of the adhesive (p = 0.08, p = 0.67, and p = 0.41, respectively).

<u>Conclusions</u>: All subjects responded that the retention of their dentures was either a little better or much better when using either of the adhesive pastes.

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DENTURE ADHESIVES are widely used as aids for increased retention and stability of dentures. It has been shown that using denture adhesive significantly reduces the displacement of the mandibular and maxillary dentures during chewing, biting, and speaking.¹⁻⁷

Denture adhesives have a place in prosthetic dental treatment, but dentists are often loath to prescribe them for fear that it indicates their failure to provide adequate prostheses. This negative attitude has been maintained over time.^{8–10} Much of the negative attitude towards the use of denture adhesives has resulted from the suggested deleterious effects.¹⁰ Within the past 10 years, the literature has revealed a change in the general attitude regarding their use.^{10,11}

Copyright © 2005 by The American College of Prosthodontists 1059-941X/05 doi:10.1111/j.1532-849X.2005.00049.x There have been a few reports in the dental literature on the number of denture wearers who regularly use denture adhesives and the reasons for their use or nonuse.^{10,12} Bates and Murphy,¹³ in a Welsh study, found that 12% of females and 10% of males used or had used denture adhesives. In another study, Wilson et al¹⁴ reported that 30% of the patients wearing dentures used or had used denture adhesives.

It has been well documented that using adhesive products provide security of retentive dentures.¹⁻⁷ One important feature of denture adhesives is the effectiveness in improving the chewing ability. It has been demonstrated that adhesives improve function and increase the forces applied to foods in chewing;¹⁵⁻¹⁹ however, denture adhesives differ in composition^{20,21} and properties that may influence patients' acceptance. The purpose of this study was to assess patients' responses to two denture adhesives with various chemistries.

Materials and Methods

The manufacturers and the compositions of the two adhesive pastes evaluated are presented in Table 1.

Thirty edentulous patients (16 female and 14 male, mean age: 62, range: 40 to 80 years) who received treatment at the Dental School,

¹Professor, Faculty of Dentistry, Department of Prosthodontics, University of Marmara, İstanbul, Turkey.

²Assistant Professor, Researcher, Faculty of Medical Sciences, Department of Dentistry and Dental Hygiene, University of Groningen, Groningen, The Netherlands.

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Correspondence to: Dr. Mutlu Özcan, PhD, University of Groningen, Antonius Deusinglaan 1, 9713 AV Groningen, The Netherlands. E-mail: mutluozcan@hotmail.com

Product	Manufacturer	Composition
Kukident (PVM-MA) Corega (CC)	Procter & Gamble Co., Rotterdam, The Netherlands Stafford-Miller Ltd. Welwyn Garden City, Herts, U.K.	 Polymethylvinylether-maleic anhydride compounds, calcium- zinc salts, paraffin, petrolatum, silicon dioxide, peppermint, menthol, menthyl lactaat, E 122,123. Carboxymethyl cellulose, monosodium phosphate, prophyl-p- hydroxybenzoate, white petrolatum, light liquid paraffin.

Table 1. Manufacturers and Composition of the Denture Adhesives Tested

University of Marmara in İstanbul were surveyed. These patients had been wearing dentures that were at least 5 years old. No patient had medical problems that would contraindicate participation in the study. Patients were informed about the objective of the study, and informed consent was supplied for the patients according to the ethical commission of the Dental School.

Patients were randomly assigned to two groups of 15 patients each for the two different adhesives. The amount of adhesive, its placement inside the dentures, and recommended method of cleaning the dentures followed the manufacturers' recommendations. Denture adhesives were applied to the maxillary dentures with four 1 cm strips of adhesive at the anterior, middle of the hard palate, and right and left middle region of the posterior segments; three 1 cm strips of adhesive were applied at the anterior segment and right and left retromolar pads of the mandibular dentures. The patients demonstrated the placement of the adhesive in their dentures to the investigator.

The subjects first used the PVM-MA-based adhesive paste as instructed for 1 week in their normal daytime and nighttime routines. They returned to the clinic after 1 week and completed the modified questionnaire of Kelsey et al¹⁷ (Table 2). After patients had completed the questionnaire, their prostheses were cleaned and given back for 1 week to allow them to reestablish their previous functional performance levels with their dentures. The patients' evaluation of CC-based denture adhesive paste followed the same 1 week testing cycle.

The data were subjected to the Wilcoxon ranks signed test for nonparametric nominal data at a significance level of $p \le 0.05$ (StatView 5.0, SAS Institute Inc., Cary, NC).

Results

The frequency of distribution of patients' responses to the questions is displayed in Table 3.

Retention

For maxillary dentures: Twenty-four (80%) and 17 (57%) of the 30 subjects were very satisfied with the retention of the maxillary denture when using PVM-MA- and CC-based adhesive pastes, respectively. There was no statistically significant difference between the two adhesive pastes on maxillary denture retention (p = 0.083).

Table 2.	Ouestionnaire	Modified from K	elsev et al, 1997)
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1-How satisfied are you with the retention of your			
a-Very satisfied	b-Fairly satisfied	c-Not quite	d-Dissatisfied
2-How satisfied are you with the retention of your			
a-Very satisfied	b-Fairly satisfied	c-Not quite	d-Dissatisfied
3-Did the use of this denture adhesive have an	,	I	
effect on your ability to chew?	h Little better	c No difference	d Worse
4- How long did this denture adhesive have an	D-Little Detter	e-ivo unicicilee	u-worse
effect on your dentures?	1 0 4 4 1	4 - 61	1.6 - 10.1
$a \le 2$ nours 5- Did you like the taste of this denture adhesive?	b-2 to 4 hours	c-4 to 6 hours	d-b to 12 hours
a-Good	b- Fairly good	c-Worse	
6- How was the removal of the adhesive from your			
dentures: a-Easy	h- Not easy	c-Very difficult	
a hasy	5 1100 Caby	e ter, annear	

		Number (%) of Re	Number (%) of Respondents		
Question	Response	Kukident (PVM-MA)	Corega (CC)		
Retention of upper dentures	Very satisfied	24 (80%)	17 (57%)		
* *	Fairly satisfied	6 (20%)	13 (43%)		
	Not quite	0 (0)	0 (0)		
	Dissatisfied	0 (0)	0(0)		
Retention of lower dentures	Very satisfied	18 (60%)	9 (30%)		
	Fairly satisfied	10 (33%)	19 (63%)		
	Not quite	2 (7%)	2 (7%)		
	Dissatisfied	0 (0)	0 (0)		
Chewing ability	Much better	22 (73%)	18 (60%)		
	Little better	6 (20%)	10 (33%)		
	No difference	2 (7%)	2 (7%)		
	Worse	0 (0)	0 (0)		
Duration of denture adhesives	≤ 2 hours	26 (87%)	11 (37%)		
	2 to 4 hours	3 (10%)	6 (20%)		
	4 to 6 hours	0 (0)	10 (33%)		
	6 to 12 hours	1 (3%)	3 (10%)		
Taste of denture adhesives	Good	27 (90%)	24 (80%)		
	Fairly	1 (3%)	4 (13%)		
	Worse	2 (7%)	2 (7%)		
Removal of denture adhesives	Easy	14 (47%)	9 (30%)		
	Not easy	7 (23%)	17 (57%)		
	Very difficult	9 (30%)	4 (13%)		

Table 3. Frequency of Distribution of Patients' Responses

For mandibular dentures: Satisfaction with the retention of mandibular dentures was higher with PVM-MA adhesive (60%) than CC adhesive paste (30%). There was a statistically significant difference between the two adhesive pastes on mandibular denture retention (PVM-MA: 18 and CC: 9; p = 0.004).

Chewing Ability

Relative to the effectiveness of chewing, 18 patients (60%) found that they were able to chew much better when using CC adhesive paste; 22 patients (73%) responded that they were able to chew much better with PVM-MA adhesive paste. Ten subjects (33%) reported their chewing ability was a little better with CC-based denture adhesive, whereas 6 patients (20%) reported PVM-MA adhesive was a little better. Significant differences were found between the two adhesives on chewing ability (p = 0.0001).

Duration of Retention

Significant differences were also found between the two adhesives on the duration of retention effectiveness in the mouth (PVM-MA: 24 and CC: 17; p = 0.0001). While 26 subjects (87%) reported that PVM-MA adhesive was effective up to 2 hours, CC denture adhesive was found to be effective by 11 patients (37%) for the same duration. Both adhesives were less effective at 6 to 12 hours.

Taste

No significant differences were found between the two denture adhesives on the taste properties (p = 0.41). Twenty-seven (90%) and 24 of the respondents (80%) rated the taste of the PVM-MA and CC denture adhesive paste as good, respectively.

Removal

While 14 (47%) subjects found the removal of PVM-MA adhesive paste easy to accomplish, 7 (23%) found it not easy to accomplish. The removal of CC adhesive paste was found easy by 9 (30%) and not easy by 17 (57%) of the patients. There were no significant differences between the two adhesives on removal from the dentures (p = 0.67).

Discussion

There is sufficient information to support the use of denture adhesives to increase denture retention, stability, and incisive ability for ill, fair, and well-fitting prostheses.^{1,6,17-19} In this study, the majority of patients were either very satisfied or fairly satisfied when they used the adhesive pastes in their maxillary dentures. Nonretentive, unstable mandibular dentures are generally the most common complaint of denture patients. The satisfaction rate for retention was still worse for mandibular dentures when compared with maxillary dentures. The possible explanation for this finding could be that the maxillary dentures occupy a larger space, and often the ridges were less resorbed when compared with the highly resorbed alveolar ridges in the mandible. Perhaps not only the denture adhesive itself, but also the heights of the existing ridges played a role in the poor satisfaction with retention of mandibular dentures.

In this survey, chewing ability was rated from a little better to much better, which is in accordance with the report of Neill and Roberts,¹⁶ who stated that the use of denture adhesives provided significant improvement in mastication performance in subjects with poor- and fair-fitting dentures.

Most adhesives contain ingredients that provide adhesion via carboxyl groups. As the adhesive hydrates, free carboxyl groups form electrocovalent bonds that produce stickiness. PVM-MAbased compounds or their copolymers are synthetic compounds that are widely used in denture adhesives. Due to its high level of carboxyl groups, sodium carboxyl methylcellulose, an adhesive ingredient, is also commonly used in denture adhesives. This material has the property of dissolving in water quicker than PVM-MA salts. In this study, most of the subjects were satisfied or fairly satisfied when using the two adhesive pastes. Satisfaction with PVM-MA adhesive was higher than with the CC adhesive. This could be due to the existence of PVM-MA calcium-zinc salts that provide greater cohesive strength for longer duration because of the stronger covalent bonds that develop via the divalent zinc action.

One important finding of this study was that the retention was less after 6 to 12 hours for both adhesives. This was probably due to their solubility in saliva; however, three patients reported that CC-based denture adhesive maintained retention more than 6 hours. The reduced retention of PVM-MA adhesive is probably due to fast solubility of the adhesive. Similar findings have been reported in earlier studies where peak retention of dentures with adhesives was 3 to 5 hours for adhesives with different formulations.^{20,21}

Denture adhesives are designed with sticky materials to provide retention. Denture adhesives should also be designed for easy removal from dentures. In this study, most of the subjects found the denture adhesives not easy to remove from the inner surfaces of the dentures and this finding agrees with the findings of previous reports.¹²⁻¹⁷

Conclusions

- The majority of the patients in this study were either fairly satisfied or very satisfied with retention of maxillary dentures. The satisfaction rate was significantly less for mandibular dentures even with the use of the tested denture adhesives.
- 2. Both denture adhesives were less effective at 6 to 12 hours than they were at 3 to 5 hours.
- 3. Chewing ability improved significantly with denture adhesive.

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