

Original Article

# The effect of denture adhesive on the efficiency of complete denture in patients with different alveolar ridges

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## ABSTRACT

**Background:** Denture adhesives are used to improve retention, stability, and efficiency of complete dentures. Proper use of denture adhesives has benefits for patients. Evaluating the effect of denture adhesives on efficiency of complete dentures in patients with different alveolar ridges was the purpose of this study.

**Materials and Methods:** This cross-over randomized clinical trials study was conducted on 90 patients who were wearing well fitted complete dentures. The patients were categorized into three groups based on clinical and radiographic situations of residual ridges. Group I with mild resorption, group II with moderate resorption, and group III with severe resorption. The patients who had recently received their dentures and the primary complications had been resolved were asked to use denture adhesive according to the instructions. The patients answered two different questionnaires in 1 week and 2 months of using denture adhesive. The answers were analyzed by means of variance and Chi-squared tests ( $P < 0.05$ ).

**Results:** Retention, chewing, talking, self-confidence, and efficiency of dentures were improved in all patients. No statistical significant differences in these parameters were observed between the three groups ( $P > 0.05$ ). Increased retention and adaptation made 64.4% of these patients willing to continue using the adhesive after the study. Forty-three percent of patients reported moderate satisfaction of using this adhesive.

**Conclusion:** Using denture adhesive in well-fitted complete dentures resulted in an improvement in retention, talking, chewing, ease of use, self-confidence, and efficiency of dentures. The use of denture adhesive is, therefore, recommended to patients wearing dentures with some problems.

**Key Words:** Alveolar ridge, complete denture, denture adhesive, denture retention

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## INTRODUCTION

Denture adhesives are commercially available. They are nontoxic and soluble (powder, cream, or liquid) materials which are applied on tissue side of dentures to improve the function of them.<sup>[1]</sup> Denture adhesive was introduced in the late 18<sup>th</sup> century. It was first invented in 1913 and developed through 1920s and

1930s.<sup>[2-5]</sup> These materials expand by absorbing water, fill up the spaces, and increase the surface tension between denture and alveolar ridge mucosa.<sup>[6,7]</sup> Although some benefits of these materials are stated by many of patients, dentists assume it as the proof of their incompetency.<sup>[2,8]</sup> Improvement of denture

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adaptation, talking, chewing, bite forces, maximum incisal force of maxillary denture, and self-confidence are some of the benefits of these materials.<sup>[3,8-10]</sup> These materials are used in clinical steps of making dentures such as study base fixation, bite registration, and improve the accuracy of denture try in.<sup>[9]</sup> Some disadvantages such as oral mucosal irritation, changes in occlusal relationships, increasing of vertical dimension, increasing of alveolar bone loss have been reported for denture adhesives, especially for insoluble ones although with no evidence.<sup>[11]</sup> No longitudinal studies on tissue response to denture adhesives have been reported.<sup>[1]</sup> However, there are several reports of bone marrow suppression and a complication of polyneuropathies associated with spinal cord injury due to the high absorption of zinc in denture adhesives.<sup>[1,11]</sup> Therefore, patients may avoid long-term use of these products.

Uysal *et al.*,<sup>[12]</sup> in 1988, evaluated the effect of four denture adhesives clinically on retention, duration of retention, chewing ability and other oral functions for 24 h, and also the ability of wiping off from the denture and oral tissues in patients whose mouth tissues were graded by Kapur index.<sup>[13]</sup> Psillakis *et al.*,<sup>[14]</sup> in 2004, evaluated the function of maxillary dentures with and without denture adhesive in 194 patients. They used a simple gnathometer and evaluated the effect of denture adhesive on speech, chewing, fitness, and self-confidence. Koronis *et al.*,<sup>[11]</sup> in 2004, evaluated the application of three types of denture adhesive in 30 edentulous patients whose supporting soft tissues were graded with Kapur index and their old dentures were replaced by new ones. In their study, some criteria such as retention, chewing efficiency, self-confidence, denture movement, and conformity with Kapur index were evaluated. Munoz *et al.*,<sup>[15]</sup> in 2001, evaluated the effect of denture adhesives on 36 patients with well-fitted complete dentures. Their results showed that denture adhesive significantly improved retention and stability, convenience, self-confidence, and also decreased denture movement on chewing.

The purposes of this study were evaluating and comparing the effect of denture adhesive on retention, chewing, speaking efficiency, ease of use, improving self-confidence, and function in patients wearing well-fitted prosthesis with three different conditions of alveolar ridge as well as evaluating the satisfaction of patients from these materials and willing of using again.

Null hypothesis is the effect of denture adhesive is the same on patients with different types of alveolar ridge

## MATERIALS AND METHODS

This cross-over randomized clinical trial (approval number of committee of ethics is 2381021912031) study was conducted on 90 patients with complete denture from those who had referred to the Islamic Azad University, Isfahan, Iran. The patients who had received their well fitted and perfect from any point of view dentures shortly before the trial (the last 6 months before starting research) were included in the study; and those with misfit dentures, xerostomia, neuromuscular disorders were excluded from the study. The sample size was calculated according to the sample size estimation formula, statistics expert and similar study. The patients were informed about the study and instructed how to apply denture adhesive Fixodent (Procter & Gamble Manufacturing CO Brown summit NC Mason Business Center 8700 Mason-Montgomery rd. Mason, OH 45040. Germany) [Figure 1] based on manufacturer's instruction. (To apply denture adhesive cream: 1 – clean and dry dentures, 2 – apply adhesives in thin strips as shown, and 3 – insert dentures and hold briefly in place) [Figure 2]. In this study, patients were reassured to participate and each patient was provided with the necessary explanations for the product, and they all participated fully in the project. The patients were asked to use the denture adhesive after resolving the post-insertion complications of dentures. The patients were then categorized into three



Figure 1: Fixodent adhesive denture.



Figure 2: How to use and put denture adhesive in the prosthesis.

groups based on clinical and radiographic features of ridges according to Wical-Swoope classification.<sup>[16]</sup> In panoramic radiography if you measure the space between the lower edge of the mandible and the lower edge of the mental foreman and then you multiply it by three, multiplication is a reliable estimate of the original height of the alveolar crest. Group 1 with a mild alveolar bone resorption up to 1/3 of original height and with vertical walls. Group 2, with a moderate alveolar bone resorption more than 1/3 and <2/3 of original height. Group 3, flat ridge, with sever alveolar bone resorption for more than 2/3 of the original height.

After receiving the patient’s satisfaction and examination, how to use dental adhesive was trained according to the manufacturer’s instructions (once a day) [Figure 2]. The patients filled out two attributed questioners in 1 week and 2 months of using denture adhesive. In the questionnaire, there was questions about the effect denture adhesive on retention, chewing comfort, speaking efficiency, ease of use, improving self-confidence and function, easy cleaning adhesive, allergy, patients’ desire to reuse.

Data were analyzed using ANOVA and Chi-square tests in SPSS software version 20 software (SPSS version 20.0, SPSS Inc; Chicago, IL, USA) ( $P < 0.05$ ).

## RESULTS

Of the 90 participants, 48 (53.3%) individuals were men and 42 (47.7%) were women. Table 1 shows 85.6% of patients reported that denture adhesive enhanced the retention of their dentures, 37.8% reported moderate enhancement, and 36.7% reported an enhancement for a limited time (6 h). Chi-square test showed no significant difference in enhanced retention between the 3 groups with different alveolar bone resorption ( $P = 0.24$ ).

Table 1 shows that 54.5% of patients reported a mild-to-moderate improvement in their speaking.

Chi-square test revealed no significant difference in the level of improvement of speaking between groups ( $P = 0.902$ ).

Table 1 shows that denture adhesive moderately comforted the process of chewing in 82.2% of patients and the difference between the 3 groups was not statistically significant ( $P = 0.6$ ), based on the Chi-square test.

By applying denture adhesive, 79.1% of patients reported comfort in using their dentures, 8.27% reported decreased pain, 77.8% reported no change in taste, and 4.64% reported improved self-esteem. Only 2.2% reported allergy to adhesive, 4.24% difficulty in cleaning the dentures and oral mucosa. Nearly 64.4% of patients were keen to keep using the adhesive following 2 months of applying. Chi-square test showed no significant difference in willing to use adhesive between groups ( $P = 0.28$ ). Increased retention and fitness was the most frequent reason (87.93%) for using the adhesive voluntarily.

## DISCUSSION

A successful complete denture treatment is the result of combining precise technique, proper patient education, and dentist’s familiarity with all the treatment techniques for maximum patients’ satisfaction. Commercial denture adhesives are the products that have the capability to improve the treatment outcomes and have benefits for the patients, when are used properly.<sup>[11,12,14]</sup>

In this study, 85.6% of the patients reported increasing retention of their dentures. This finding is consistent with previous studies.<sup>[4,11-15]</sup> Denture adhesive by increasing viscosity, maintaining the continuity and minimizing the thickness of saliva, as the intermediate material between denture and bed, increases fitness of denture.

**Table 1: Frequency distribution (%) of the effect of adhesive on denture retention, speaking improvement, chewing improvement in groups**

Effect	Groups								
	Mild resorption			Moderate resorption			Sever resorption		
	Retention	Speaking	Chewing	Retention	Speaking	Chewing	Retention	Speaking	Chewing
No effect	23.3	33.3	23.3	6.7	20	13.3	13.3	43.3	16.7
Mild effect	30	30	23.3	10	33.3	30	33.3	20	30
Moderate effect	33.3	33.3	40	53.3	26.7	36.7	26.7	20	33.3
Sever effect	13.3	3.3	13.3	30	20	20	26.7	16.7	20
Total	100	100	100	100	100	100	100	100	100

There were no statistical significant differences in improved retention between the three groups with different ridge conditions, while Koronis *et al.*<sup>[11]</sup> reported that the effect of denture adhesive on retention is more in patients with weakened supporting tissues. This difference can be related to the difference in patients and the used adhesives.

Mild-to-moderate improvement in talking was reported by 67.8% of patients. Lack of sufficient retention, miss fitness, mobility, displacement, and also mediolateral movements may all be the reasons of speech disorder in patients.<sup>[14]</sup> Denture adhesives can improve speech by limiting the movements through enhancing fitness and retention.<sup>[14]</sup>

Increased chewing ability was reported by 82.2% of patients. This finding is along with the previous studies.<sup>[12,14,17-19]</sup> In spite of this study, Nicolas *et al.*<sup>[20]</sup> did not observe statistical significant changes in chewing parameters.

The results of our study did not show significant differences in improvement of chewing between the three groups of patients with different alveolar ridge conditions while Koronis *et al.*<sup>[11]</sup> in 2010 and Fujimori *et al.*<sup>[10]</sup> in 2002 reported a significant enhancement in chewing ability, especially in cases with weakened denture supporting tissues following applying denture adhesives. Regarding the hyper movement of dentures on decreased supporting tissues and consequently pain during eating, the higher rate of enhancement in chewing ability in these patients, compared to patients with good supporting tissues, can be attributed to the effectiveness of denture adhesive in these patients.

Increased comfort following applying denture adhesive was reported by 71.9% of patients. This finding is consistent with Psillakis *et al.*<sup>[14]</sup> and Munoz *et al.*<sup>[15]</sup>

Inefficiency of denture adhesive in reducing the pain induced by pressure was reported by 72.2% of patients. This feedback was expected regarding this fact that pain on pressure is related to the weakness of supporting tissues.

Affected taste was reported by 22.2% of patients. Flavored denture adhesive was interesting for 35.55% of patients. Today, flavored denture adhesives are available.<sup>[21]</sup>

Self-confidence increased in 64.4% of patients which is consistent with previous studies.<sup>[11,14,18]</sup> Psillakis *et al.*<sup>[14]</sup> reported almost the same frequency (63.9%)

of self-confidence improvement in patients using denture adhesive. No difference in the level of self-confidence was detected between the three groups with different ridge conditions.

In this study, 24.4% of patients had difficulties in removing the adhesive. Increased viscosity by the manufacturer to improve the adhesive property might be the reason.

Only two patients (2.2%) experienced allergy to adhesive. Today adhesives are benzene free, or have minimum amount of this material, benzene is potentially a carcinogen material.<sup>[1]</sup>

The contentment level of the use of these materials in this study was moderate and 68.3% of patients reported an overall improvement in efficacy of their dentures. Psillakis *et al.*<sup>[14]</sup> reported an improvement in denture function for 79.2%.

## CONCLUSION

The results of this study showed that applying denture adhesive in well-fitted complete dentures caused improved retention, speaking, chewing, and efficacy; ease of use; increased self-confidence in patients. There were no statistical differences in these parameters between the three groups with mild, moderate, and sever alveolar ridge resorptions. Contentment level of applying this material was moderate, and the patients were willing to use it again. It may be concluded, therefore, that denture adhesive can be prescribed for patients with different alveolar ridge conditions wearing well fitted, but with difficulties, completed dentures.

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## Conflicts of interest

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or nonfinancial in this article.

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