

Clinical application of Denture adhesives - A review

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Abstract

These days, denture adhesives are commonly used by denture wearers. People began using denture adhesives more than 200 years ago; however dentists have been slow in acknowledging their role in prosthetic dentistry. Undoubtedly denture adhesives can be an asset to the dentist's armamentarium, in that, it should be properly used and patients should be adequately counseled.

Key Words: Dentures, denture adhesive, retention, stability.

Introduction

Denture adhesives are commercially available products which are used by many denture wearers as an over-the-counter approach to improve denture retention and stability. Denture adhesives can enhance aspects of performance of complete well-fitting dentures as well as provide increased comfort, confidence, and satisfaction with dentures. In situations where it is not possible to obtain the desirable retention, adhesives can be used to increase retention and stability of complete dentures. Denture adhesives may also be used in the following situations:¹

1. As an aid in retention during the fabrication phase of a denture,
2. As an aid to the retention of dentures and special appliances such as obturators when there are physical limitations to the degree of retention that can otherwise be achieved, and
3. As a vehicle to aid the application of drugs to the oral mucosa.

With an increase in the number of elderly edentulous patients, there is likely to be a greater demand for denture adhesives.² It has been reported that in 1970 Great Britain alone used 88 tons of denture adhesives. An epidemiologic study done at approximately the same time in the same country revealed that 10% of male and 12% of female patients with dentures used such adhesives on a regular basis, and more recent publications from the United States 'indicate similar

results. It has been reported that, approximately 75% of American dentists are reported to recommend their use for their patients with dentures.¹ Annual US sales figures for 1996-97 reveal that 55 million units of denture adhesives (powders, pastes, and creams) were sold for over \$200 million dollars.³

On the other hand, it has been postulated that denture adhesives may (1) encourage the prolonged use of ill-fitting dentures and thus promote residual ridge resorption, (2) interfere with the occlusion as a result of the uneven and uncontrolled thickness of the intervening adhesive, and (3) act as allergens or irritants. Dentists must be knowledgeable about denture adhesives, including the advantages and disadvantages for each product, to provide appropriate advice and information to patients. This review article attempts to discuss the issues concerning the use of denture adhesives.^{1,2}

Review of Literature

1. Panagiotouni E et al.¹ compared the retentive ability of various denture adhesive materials which were in powder, paste and cushion form and found that the adhesive materials studied exhibited a significantly greater retentive ability than that of saliva, and their retentive ability increased significantly when they were used in combination with artificial saliva. The adhesives in paste form showed greater retentive value in comparison to the adhesive powder. Greater retentive value was demonstrated by a adhesive cushion (Fittydent), and one other adhesive cushion

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(Dental Block) exhibited the lowest retentive values compared with the other adhesives.

2. Tezvergil-Mutluay A et al.⁴ reviewed the literatures that documents the health hazards due to prolonged, excessive zinc ingestion from the overuse of denture adhesives. Excessive zinc ingestion can lead to increase in serum zinc level, which will result in decrease in serum copper level. The low serum copper levels cause bone marrow depression and widespread sensory and motor neuropathies. Epidemiologic studies revealed the source of excessive zinc intake to be from overuse of denture adhesives. The authors recommend zinc-free denture adhesives to denture patients. It is equally important to periodically relines denture bases to minimize the need for denture adhesives.
3. Oliveira MC et al.⁵ in their study, aimed to determine the effect of denture adhesive on oral quantities of *Candida* species. Results showed that there were no statistically significant differences between the test and control groups during the test periods. They concluded that the denture adhesive tested did not significantly alter the oral microbiota.
4. Sumita YI et al.⁶ evaluated the usefulness of a denture adhesive in edentulous patients after maxillectomy according to the remaining residual maxilla. Eight edentulous patients, who had undergone maxillectomy, participated in this study. The patients were divided into three groups according to the area of remaining residual maxilla, Group 1 (half remaining residual maxilla), Group 2 (quarter < remaining residual maxilla < half) and Group 3 (remaining residual maxilla quarter). They found that the denture adhesive definitely improved speech and masticatory function in edentulous maxillectomy patients. However, it must be considered that this effectiveness depends on the area of residual maxilla, especially for the masticatory function. If the remaining maxilla is less than a quarter, as in Group 3, the effectiveness of the DA is nullified.
5. Munoz CA et al.⁷ studied the use of denture adhesive in well-fitting dentures. Various denture adhesives in cream form and strip form were used in their study. Results showed that denture adhesives significantly improved retention and stability of well-fitting dentures and the subjects experienced significantly less-dislodgement while eating an

apple after the adhesive was applied to dentures. Subjects confirmed the improvement in confidence and comfort as well as decreases in denture wobble with the use of adhesive. Single application of denture adhesive gave them a greater satisfaction with dentures in conjunction with chewing hard and brittle foods. The increase associated with the cream adhesives were highly significant compared to no adhesive ($p < 0.0001$). For strips, increases in stability were significant ($p < 0.001$), and increase in retention were highly significant.

Discussion

Denture adhesives are frequently used by denture wearers to increase the retention and stability of the complete denture, to improve the chewing and masticatory ability, and to psychologically support the patient to make the complete denture more acceptable.¹ Denture adhesives are formulated with a mixture of short- and long-acting synthetic polymers that hydrate and increase in volume to fill voids between the denture and mucosal tissues. In addition, the increased viscosity of hydrated adhesive helps to optimize interfacial forces that aid in denture retention. The long-acting polymers improve cohesive forces within the adhesive through molecular cross-linking, increasing the strength of the adhesive film and extending resistance to wash out from under the denture.⁸

Denture adhesives are the useful adjunct to denture retention and stability. Kapur⁹ in 1967 did a study of the clinical use of denture adhesives and concluded that denture adhesives unequivocally increased denture retention, thereby improving denture wearers' incisive ability. Chew¹⁰ and colleagues used a kinesiographic technique to determine the effectiveness of denture adhesives in improving retention and stability of complete maxillary dentures in vivo. Results indicated that the adhesives improved retention and stability of both well-fitting and ill-fitting dentures but exerted their greatest effect with ill-fitting dentures. Adisman¹¹ reported that the improved retention achieved by patients who used adhesives allowed them to increase their biting force during chewing and reduce the number of chewing strokes. Adhesives provide a cushioning effect, reduce the ability of food particles to collect under the denture flanges and inhibit the growth of *Candida albicans*.

Researchers have shown that the denture adhesives do not support microbial growth. Makihira S et al¹², 2001,

suggested that denture adhesives possess antifungal activity to a greater or lesser degree. One of the products in their research caused the reduction of pH below 5.0 and hence, in the daily use of denture adhesives, attention should be paid to both the materials and their microbiologic properties. In a study to determine the effect of a single denture adhesive on oral quantities of *Candida* species in vivo, Kim E et al¹³, 2003, suggested that the denture adhesive tested did not significantly alter the denture microbiota during the 14-day trial period. Similar conclusion was drawn by Driscoll CF and Minah GE.¹⁴

Modern denture adhesives are available in different forms such as creams, strips, and powders to fulfill a range of consumer needs. It has been found that the paste form of adhesive is more retentive than the powder form. This could be attributed to the increased viscosity of the paste forms. Panagiotouni E et al¹, 1995, in their study, reported that the adhesive pastes exhibited greater retentive force values than that of adhesive powders, even the ones of the same brand name. Chew¹⁵ and later Ghani and Picton¹⁶ demonstrated that the liquid/paste form of denture adhesive rendered the ill-fitting dentures almost as retentive as well fitting one. In another study, Chew et al¹⁷ used kinesiographic instrumentation to demonstrate that paste and powder adhesives containing long-acting polymer, PVM-MA (Polymethyl vinyl ether-maleic anhydride) or gantrez salt improved retention and stability of both well- and ill-fitting dentures.

The regular use by denture wearers of an appropriate denture adhesive is not associated with any increased incidence in mucosal irritation. Tarbet WJ and Grossman E¹⁸, in 1980, suggested that the use of such an adhesive can, in fact, reduce the likelihood of the occurrence of tissue irritation and, at the same time, provide the denture wearer with specific benefits, both physical and psychological. In an extensive 1984 review on denture adhesives and their relationship to tissue irritation and bone resorption, Boone¹⁹ commented that “much of this information is fact, but more of it is fallacy, especially as it relates to the causes of alveolar bone change.” Boone¹⁹ pointed out that the various over-the counter products available for altering prostheses’ fit and function have often been lumped together and “accused of destroying bone, or at least of causing bone changes.” He suggested that the denture adhesives tend to distribute the denture load more evenly on the supporting tissues. This even distribution provides a cushioning effect

and, when adhesives are used properly, these same properties also evenly distribute occlusal forces to the tissue-bearing surface. If the use of adhesives were to cause bone resorption, the stresses involved would have to be transmitted through the oral mucosa, even with ill-fitting dentures. If these stresses were of sufficient magnitude or duration to cause bone changes, it would be reasonable to expect that soft tissue lesions would occur. Yet, in the presence of adequate hygiene, such changes are not observed.

Recently, there has been concern regarding the serious adverse systemic effects due to heavy use of denture adhesives. Excessive use of zinc containing denture adhesives may cause bone marrow suppression and polyneuropathy that can result in numbness and paresthesia of the extremities, loss of balance, and walking problems. S.P. Nations et al²⁰, 2008, documented a possible association between markedly excessive denture cream use and hyperzincemia, secondary hypocupremia, and subsequent neurologic symptoms. The root cause of excessive zinc ingestion from denture adhesives in patients is poorly fitting dentures. Too often, patients resort to the use of denture adhesives to compensate for the space that develops over time between denture bases and the underlying mucosa. As more alveolar supporting bone is lost, such patients may use more adhesive. Tezvergil-Mutluay A et al⁴, 2010, recommended zinc-free denture adhesives to denture patients. Dentists need to stress the need for periodically relining denture bases to minimize the need for denture adhesives. Endosseous implants can also improve denture stability.

Summary

A denture adhesive can be of considerable benefit to many denture wearers, even those with good quality denture support tissues. Dental professionals and educators should make a realistic assessment of the proper use of denture adhesives and counsel patients on the use of adhesives. Intelligent assessment can be done only from a valid knowledge base, and toward that end, continued research and vigilance into the use of denture adhesives are essential. The statement made by Tautin²¹, 1978, holds good even today. “Denture adhesives will be with us until we eliminate the need for complete dentures. The major problem with denture adhesives is not their effect on tissue or the results of their long-term usage, nor even their effect on vertical dimension; it is that the dental profession knows so little about them.”

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