A REVIEW OF DENTURE ADHESIVES USED IN THE DENTAL PROFESSION.

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ABSTRACT

The dental profession has been slow to accept denture adhesives as a means to enhance denture retention, stability and function. Despite considerable documentation advocating patient’s use of adhesives, many dentists view adhesive usage as a poor reflection of their clinical skills and prosthetic expertise. This article outlines the mechanism of denture adhesive action, and discusses the clinical relevance of study findings and expert opinions. If properly used, denture adhesives can be an asset to the dentist's armamentarium. This article reviews much of the recent research on adhesives and outlines their advantages and disadvantages.

KEY WORDS: Retention, Stability, Mastication.

INTRODUCTION

Successful complete denture treatment combines exemplary technique, effective patient rapport and education and familiarity with all possible management options to provide the highest degree of patient satisfaction. Dentists need to know about denture adhesives to be able identify those patients who actually need them and to be able to educate them about the advantages, disadvantages and correct use of these products. Denture adhesives are commercially available nontoxic, soluble materials that when applied to the tissue surface of dentures enhance their retention, stability and performance.¹

Mechanism of action

These materials enhance the interfacial forces by increasing the adhesive and cohesive properties and viscosity of the medium lying between the denture and the basal seat and eliminating the voids between the denture base and the basal seat. According to Shay² the material swells 50 to 150 percent by volume in the presence of water, filling in spaces between the prosthesis and the tissues. The physical forces are based on a principle derived by Stefan over a century ago, which states that the force required to pull two disks or plates apart is directly proportional to the viscosity of the liquid between them. Saliva increases the viscosity of the adhesive, thereby increasing the force required to separate the prosthesis from the oral surface. Modern adhesives provide strong bio adhesive and cohesive forces via carboxyl groups. Polymethyl vinyl ether-maleic anhydride or PVMMA copolymer is a synthetic compound widely used in denture adhesives because of its high level of carboxyl groups. Sodium carboxymethylcellulose, or CMC, a naturally derived adhesive ingredient, also is commonly used because of its carboxyl groups. Although it provides a strong initial hold when used alone, CMC quickly dissolves due to its high level of solubility. Manufacturers introduced products that combined PVM-MA zinc and calcium salts with CMC. These materials provided even greater cohesive strength for longer durations because of the stronger covalent bond that develops via the divalent zinc cation.

Clinical implications and patient Satisfaction

Adhesives provide a cushioning effect, reduce the ability of food particles to collect under the denture flanges and inhibit the growth of Candida albicans. Denture adhesives help distribute occlusal forces across the denture-bearing area of the mucosa during chewing, clenching, gnashing and bruxing, thereby limiting local pressure points. Sometimes patients with well-made dentures experience retention difficulties. The acrylic resin of the finished denture does not possess the same adhesive qualities as the impression materials, and thus the retention of the finished dentures is not comparable to that of the impression material. Patients normally complain about poor retention of mandibular dentures. For patients with a normal tongue position (approximately 65 percent of the population), retention is not a problem. For both new and experienced wearers, the serviceability of
<table>
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<tr>
<th>Author(s)</th>
<th>Year</th>
<th>Indications</th>
<th>Contraindications</th>
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<tbody>
<tr>
<td>Tarbet, Grossman</td>
<td>1980</td>
<td>Reduces likelihood of irritation, psychological advantage, increased retention.</td>
<td>None listed.</td>
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<tr>
<td>Tarbet et al</td>
<td>1981</td>
<td>Increased retention, increased stability, increased biting force.</td>
<td>None listed.</td>
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<td>Polyzois</td>
<td>1983</td>
<td>For patients with new or immediate dentures, apply medications via the oral mucosa, for patients with specific problems like xerostomia, geriatric patients and those with poor muscle tone like Parkinson's.</td>
<td>Not for patients with ill fitting dentures or those who overuse denture adhesives.</td>
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<td>Boone</td>
<td>1984</td>
<td>Serves as an adjunct to the maxillary prosthesis.</td>
<td>Not for patients with medication induced xerostomia where denture adhesives need ample of saliva.</td>
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<td>Chew</td>
<td>1984</td>
<td>Increased retention, increased stability.</td>
<td>Not for use as a substitute for well fitting dentures.</td>
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<td>Adisman</td>
<td>1989</td>
<td>Increases stability of trial bases during denture fabrication, improves denture stability in older patients, enhances comfort, provides a cushioning effect, protects underlying mucosa, improves stability for new and experienced denture wearers, enhances denture service.</td>
<td>Not for use with ill fitting dentures or patients allergic to the components of denture adhesives or patients who cannot clean their dentures properly.</td>
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<td>Shay</td>
<td>1991</td>
<td>Increases retention and stability in poorly retained or unstable dentures, improves denture bearing surface, improves oral anatomy for patients who are not good surgical candidates, improves subjective chewing ability, provides increased sense of security for patients who are actors, teachers etc, simplifies placement for patients with tactile or movement deficit.</td>
<td>Not for use with transitional, immediate or temporary dentures where trauma can result from inadequate denture hygiene or adherence to the sutures. Not recommended under ill-fitting dentures. Not to be used as a substitute for tissue conditioners or relining procedures.</td>
</tr>
<tr>
<td>Grasso et al</td>
<td>1994</td>
<td>Improves retention and stability during chewing, swallowing and speaking, substantially increases the incisal biting force and reduces number of chewing strokes, reduces medio-lateral and vertical denture movements.</td>
<td>Not for use under ill-fitting dentures.</td>
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dentures is enhanced, and patients have achieved varying degrees of success in the areas of comfort, function and aesthetics when using adhesives. However, for the remaining 35 percent of patients who have a retracted tongue, a newly fabricated mandibular denture worn without a denture adhesive is often a problem in terms of stability and retention. Kelsey and Lang designed a Health Related Quality of Life questionnaire which ranged from dissatisfaction with retention to an improved ability to chew. Patient responses to HRQL questions showed that the retention was much better with all of the five different adhesive pastes used.

Patients, especially those who have vocations of high public visibility, such as attorneys, executives, actors, public speakers and vocalists usually fear embarrassment from movement of their dentures. For them, using adhesive products provides the security of a retentive denture.

Retention and Denture Adhesives
Kapur devised a method for scoring denture retention and stability that is still used to describe ill-fair- and well-fitting prostheses. He concluded that denture adhesives unequivocally increased denture retention, thereby improving denture wearers incisive ability.

Using radio telemetry, Stafford and Russell measured changes in pressure at the denture base-mucosa interface, with and without adhesive. They found that the use of denture adhesives allowed much greater occlusal pressure.

Tarbet and colleagues again addressed the role of adhesives in denture retention and stability by counting denture dislodgments in patients who were eating standardized portions of food (celery, apple, steak and hard roll sandwich), with and without adhesives. This research included the patient perspective as well; the patients perceived that the adhesive improved ability, confidence and comfort, and reduced “wobble” and the amount of food-particle collection under dentures.

Chew 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.

In 1981, Tarbet and colleagues reported the biting force of denture wearers as measured by radio telemetry and gnathodynamometry. This study tested biting forces in patients who had tissues judged as unlikely to provide good retention and stability with dentures. The results indicated that, when adhesives were used, these patients achieved biting forces similar to those achieved by patients with more satisfactory support tissues. Subjectively, the adhesive provides confidence; objectively, it allows the development of needed forces in the biting and chewing of foods.

Fujimori etal conducted a study to examine effects of denture adhesives on the masticatory functions of complete denture wearers considering different conditions of denture bearing tissues. The use of denture adhesives increased maximum biting force and provided rhythmic masseter muscle activity during mastication for all patients, but masticatory function improvement was more significant for denture wearers with poor denture bearing tissues than good denture bearing tissues. Similar observations were made by Hasegawa etal who estimated the retention and stability of dentures after using adhesives in three dimensional as well as rotational movements and subsequently its effect on chewing function. The results indicated that denture adhesives contributed to reducing denture movement thus improving function. Grasso and co-workers showed that denture adhesives helped patients generate significantly greater levels of incisal bite force up to eight hours after application.

Tissue irritation and bone resorption.
A number of studies have established that a definite pattern of bone Resorption occurs in the edentulous mouth with or without dentures and with or without denture adhesives. The soluble denture adhesives gradually dissipate by dissolving in the patient's saliva. The physical characteristics of denture adhesives- the ability to flow under pressure, spread over the denture and eventually dissipate suggest that, unlike the insoluble products, 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. In 1980, Tarbet and
Grossman reported a six month investigation on the incidence and severity of mucosal irritation in a group of 111 denture wearers who regularly used commercial denture adhesives. This study reported no increased incidence of mucosal irritation. In addition, the researchers found that mucosal irritation present in some patients at the start of the study improved or was eliminated when the adhesive was used. The authors concluded that the use of an appropriate adhesive can reduce the likelihood of tissue irritation. The 1994 Grasso and colleagues study reported statistically significant improvement in all dimensions of movement when an adhesive was used. This suggests that tissue trauma might decrease, not increase, with the use of adhesives.

The dental profession

Coates in 2000 conducted a study to analyse the actual usage of denture adhesives by patients. In his study 52% of the patients saw no need for the use of adhesives as they could manage their dentures well, 20.5% patients did not know that denture adhesives existed and 32.9% patients had tried them but only 6.9% patients continued to use them on a regular basis.

Slaughter in 1999 surveyed a panel of leading prosthodontists and they felt that denture adhesives insertion phase. He also suggested that only through education for dentists and patients would the dual goal of their correct usage and minimising their misuse be achieved.

Denture adhesives merely reduced the amount of lateral movements that even well fitting dentures undergo whilst in contact with basal tissues. However this benefit may mislead a patient into ignoring his need for seeking professional help even if the dentures become ill-fitting.

Today dentistry has advanced to the stage of osseointegration through dental implants. However, availability of bone in different areas of the jaw is the primary concern for most patients. Surgical techniques available for bone augmentation may not be suitable to all patients because of systemic problems or financial reasons. Yet maxillary and mandibular implant supported over dentures is a viable and successful treatment option for most complete denture patients, providing them with the security that could be achieved through the use of denture adhesives. However the dentist might still encounter patients who would benefit from the use of adhesives and thus the profession should have an open mind towards their use.

SUMMARY AND CONCLUSIONS

A review of the literature has shown that, except for its use in an ill-fitting prosthesis, there has been nothing contradicting the use of denture adhesives. Adhesives improved masticatory function, retention and stability, incisal bite force and imparted comfort, both physical and psychological, for the patient. While professionals and educators agree that denture adhesives should not be used as a substitute for adequately constructed or properly fitting prostheses, a number of patients, with varying degrees of well-fitting prostheses, rely on and benefit from the use of adhesives. As dentists, it is our responsibility to be knowledgeable and caring enough to assist each patient in adapting to dental prostheses. This may require recommendation of denture adhesives and counselling on their use. Also, continued research and vigilance into the use of denture adhesives is essential.

References


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