

Denture Adhesives – A Review

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Abstract: *Denture adhesives are used to improve the retention and stability of dentures in a large number of patients without any advice from dentists. In the United States, denture adhesives are used by more than 5 million denture wearers. Denture wearers mainly use denture adhesive to compensate for ill fitting dentures as well as to alleviate discomfort. It seems reasonable for denture wearers to use denture adhesives to enhance denture retention and stability. However, dental professionals are still undecided as to whether dentists should advise denture wearers to use them. Hence the aim of this review is to throw light on the literature evidence of effectiveness of denture adhesive by complete denture wearers*

Keywords: Denture adhesive, complete denture, retention, stability

1. Introduction

Denture adhesives are used to improve the retention and stability of dentures in a large number of patients without any advice from dentists. In the United States, denture adhesives are used by more than 5 million denture wearers. Denture wearers mainly use denture adhesive to compensate for ill fitting dentures as well as to alleviate discomfort.

It seems reasonable for denture wearers to use denture adhesives to enhance denture retention and stability. However, dental professionals are still undecided as to whether dentists should advise denture wearers to use them. [1]

Denture adhesives are classified according to manufacturing type, i.e., powder, paste, tape or cushion. Soluble denture adhesives such as the powder and paste types do not damage the soft tissues. There are some forcing situations where providing desirable retention to the denture may be a problem [2,3]. Dental experts and professionals have taken years to identify that denture adhesives are pivotal as a means to enhance denture retention, stability and function. The major reason that holds back professionals from using these is that they feel adhesive usage as a poor reflection of their clinical skills and prosthetic expertise. Usually during the process of impression taking, it is made sure by the dentist that there is maximum area of coverage for maximum tissue-denture contact, and then an effective border seal. But in some situations, the use of denture retention materials/techniques, like implants and denture adhesives becomes indispensable [4]. This might be in cases such as immediate restorations, complicated prostheses-obturator, dry mouth, the difficult and demanding patient, poor ridge anatomy and relations, and in public like attorneys, actors, and politicians. Also, with the passage of time, shrinkage in the bone structure in the mouth causes dentures to gradually become loose. In such cases, the dentures should be realigned or new dentures must be made that fit the mouth properly. [5]

Denture adhesives fill gaps caused by shrinking bone and give temporary relief from the loosening dentures. Jagger et al. [6] have outlined some more situations where the use of denture adhesives becomes mandatory for the improvement of the quality of retention. These are cases of severely atrophied edentulous ridges of severe grade; severely abused/hypertrophied tissue covering the ridges; patients

having lack of neuromuscular control (e.g. stroke and Parkinsonism); cases with xerostomia; maxillofacial defects which provides inadequate tissue support and patients with lack of neuromuscular control [7].

The Glossary of Prosthodontic terms defines denture retention as “the resistance of a denture to dislodgement” [8]. As defined by the United States Food and Drug Administration (US-FDA), ‘Denture adhesives are pastes, powders or adhesive pads that may be placed in/on dentures to help them stay in place. Sometimes denture adhesives contain zinc to enhance adhesion’ [9]. In other words, denture adhesives are commercially available nontoxic, soluble materials that when applied to the tissue surface of dentures enhance their retention, stability and performance [7,10].

2. Composition

Dental adhesives are composed of three large groups of materials. A first group comprises the actual adhesives, including a broad range of classical products such as plant gums (karaya, tragacanth, acacia), and more recent components based on natural (methylcellulose, hydroxymethyl cellulose, carboxymethyl cellulose) and synthetic polymers (polyethylene oxide, acrylamides, polyvinyl acetate). A second group of materials comprises antimicrobial agents such as sodium borate, sodium tetraborate, hexachlorophene or propylhydroxybenzoate and ethanol. These substances act as preservatives and are moderately active against *Candida albicans*. The third group of materials in turn consists of binding agents, humectants (sodium laurylsulfate), flavoring agents (mint or natural oils of salvia, olive, chamomile, etc.) and plastifiers. [11-13]

3. Modifications

Combined Polymethyl vinyl ether-maleic anhydride (PVM-MA) zinc and calcium salts with carboxymethylcellulose (Fixodent and Poli-Grip). Chronic, excessive ingestion of zinc can result in copper deficiency, which is an established and increasingly recognized cause of neurologic disease (intense headaches, difficulty breathing, difficulty walking and facial weakness) and blood Disorders (Abnormal blood pressure and heart rate). If left untreated Zinc Poisoning can be deadly.

Requirements to be fulfilled by adhesives - It should be not irritating and completely biocompatible, without an odor or taste. Application should be easy & flow should be minimal so the adhesive remains as placed and should be easily removed from both the denture undersurface and the mucosa. The adhesive properties should remain for 12 to 18 hours.[14]

4. Mechanism of Action

Way back in 1991, [15] Shay had described the mechanism of action of most of these denture adhesives. He studied that these materials swell from 50-150% by volume in the presence of water, filling the spaces between the prosthesis and the tissues. They 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.

5. Ideal characteristics of denture adhesives

An ideal denture adhesive should be formulated so that it is not toxic to the systemic or oral health of the patient (regardless of short- or long- term use); it is incapable of promoting bacterial or fungal growth; it improves the dentures' retention, stability, and functionality (that is, the ability to chew foods); it is easy for the patient or primary caregiver to apply and remove; it has an acceptable aroma (or no aroma), taste, and consistency; it does not alter or degrade the intaglio surface of the denture base; it does not modify the occlusion of the dentures; [16] it maintains adhesive capabilities for 8-12 hours; and it is cost effective for the patient.

Material	Purpose
Methyl vinyl ether-maleic anhydride copolymer	High molecular weight copolymers with adhesive and cohesive properties
Karaya gum	Thickener
Tragacanth	Water-soluble mixture of polysaccharides that absorbs water to become a gel
Acacia	Preservative
Pectin	Gelling agent
Gelatin	Gelling agent
Carboxymethylcellulose	Viscosity modifier/thickener
Mineral oil	Suspending and levigating agent
Antimicrobial agents (for example, ethanol, sodium borate, sodium tetraborate, hexachlorophene)	Antimicrobial
Non-toxic additives	Wetting agents and plasticizers
Flavoring agents (for example, peppermint oil, wintergreen oil)	Improves taste

Prevalence of adhesive usage

Little published data exists regarding the prevalence of denture adhesive use. An Australian study evaluated 146 patients wearing dentures and found 52% of the patients did not use denture adhesive, as they believed they satisfactorily managed their dentures without it. Among the remaining denture wearers, [17] 20.5% did not know denture adhesive existed, 32.9% used denture adhesive in the past, and only 6.9% use denture adhesive on a regular basis. More recently edentulous patients over a 10-year period and found

that only 15% of the completely edentulous patients with existing complete dentures acknowledged using denture adhesive. There was a direct correlation between complete denture dissatisfaction and denture adhesive use, which the authors attributed to poor retention and function of the dentures[18]

Indications

According to shay adhesives are indicated when well-made complete dentures do not satisfy a patient's perceived retention, for the patient who require extra security (Actors, teachers) and stability expectations and patient with tactile or movement deficits. According to Boone, 1984 it Serve as an adjunct to the maxillary prosthesis. According to Adisman, 1989 it serve to stabilize trial bases and trial denture. According to Grasso, 1994 it produces significantly greater levels of incisal Bite force .[18,19]

Contraindications

According to Polyzois, 1983 and Shay, 1991 adhesive is not indicated for the retention of improperly fabricated or poorly fitting prostheses or as substitute to a reliner or tissue conditioner or patients with temporary or immediate dentures where infection could result from inadequate oral hygiene or adherence to dentures. Further, not to be used in patient allergic to component of adhesive[20]. ex. Karaya.

Advantages of using denture adhesive

Twenty studies were identified and reviewed; nineteen of them were clinical trials that focused on the use of denture adhesives relative to denture retention, stability, movement, bite force, ability to chew test foods, and patient satisfaction. Most of the studies were short in duration and examined only maxillary dentures. Some trials randomly allocated patients to various experimental groups .[21] Other trials stated denture adhesives improved the retention and stability of the prostheses investigated.

A number of studies indicated that the improvement in retention and stability was more pronounced in old or ill fitting dentures when compared to new prostheses.[22-25]. However, a 1994 study by Grasso et al reported no difference in adhesive-related improvement between prostheses that fit well and those that fit poorly. In a 2011 study, Figueiral et al used vertical tensile tests and intraoral resistance transducers and reported that denture adhesives improved retention of maxillary complete dentures. [26]

Using a multichannel magnetometer tracking system to evaluate jaw movements, Rendell et al evaluated the impact of denture adhesives on the chewing rates in complete denture patients. The mean chewing rates increased immediately after applying the adhesive and continued to increase after two and four hours.[27]. Ghani & Picton suggested the retentive force for some types of adhesives do not peak until 2-3 hours after denture insertion.[25]

6. Discussion

Complete edentulism remains a prevalent health issue. Although contemporary treatment modalities (such as implant-supported and retained prostheses) improve the treatment outcome for edentulous patients significantly,

conventional complete dentures remain the primary method for restoring edentulous arches. Complete dentures are retained in the oral cavity by a series of complex interactions involving atmospheric pressure, intimate adaptation of the underlying denture-bearing tissues to the intaglio surface of the prosthesis, saliva of acceptable viscosity present between the tissues and prosthesis, and accurate peripheral extensions of the denture borders based on physiological movements. However, following exodontia, both hard and soft denture-bearing tissues are remodeled constantly via the process of RRR.[27,28]

Denture adhesive material functions by swelling and gelling upon insertion to fill the space between the soft tissues and denture base. Removing zinc from denture adhesive formulations has reduced neurological problems related to denture adhesive toxicity. Unfortunately, no longitudinal studies of more than six months' duration have been performed to evaluate patient comfort, tissue changes, or denture serviceability [29]. The short-term functionality of denture adhesives is regarded as beneficial; however, at present there is little information available concerning extended use of these materials, particularly in terms of whether adhesives prevent patients from seeking routine dental care because the adhesives provide a false sense of security. It is vitally important that dentists inform patients of the advantages and disadvantages of denture adhesives, instruct and demonstrate how to apply and remove adhesives correctly, and educate patients concerning the significance of routine recall appointments for a removable prosthesis. It is indisputable that standard guidelines for denture adhesive application and removal are needed.[30]

7. Conclusion

Based on a detailed review of the relevant literature, one can conclude that when properly used, denture adhesives improve complete denture retention and stability as well as overall function, thus improving the edentulous patient's comfort. There is a paucity of evidence concerning the effect of long-term (that is, for more than six months) [31] use of dental adhesive. Denture adhesives should be used according to the manufacturer recommendations, following specific guidelines for application and removal to prevent potential misuse. When prescribing and using denture adhesives containing zinc, one should be aware of their potential for adverse systemic effects. Based on this literature review, dentists should develop and implement long-term maintenance and recall programs for edentulous patients.

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