

Denture Disinfectants used in Prosthodontics - A Review

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ABSTRACT

As the incidence of edentulousness is ever rising, the need for dentures as well as their hygiene is of utmost importance. Several studies have indicated the implications of poor denture hygiene to systemic infections including endocarditis and pneumonia. The role of chemical denture disinfectants is pivotal as they are economical as well as easier to apply without causing much damage to the prosthesis. A variety of denture disinfectants are available in the market but it is up to the dentist to advise the particular type of disinfectant to the patient. Patient education about the availability together with the pros and cons of the individual denture disinfectant as to be mandatorily done by the dental practitioner.

Keywords: Denture Disinfectants, Denture Cleansers, Complete Denture Hygiene.

INTRODUCTION

As the world is ageing care extended to geriatric population has to be thoughtfully planned and implemented. One of the commonest ailments prevalent among these population groups is partial or complete edentulousness. Hence the dentist /speciality dentist plays a significant role in executing the rehabilitation procedure. In addition to this, the dental practitioner or the specialist dentist has to chart out a review and maintenance protocol for the rehabilitated patients to prevent any post treatment complications or sequelae.

Most of the partial denture or complete denture patients leave the dental clinic with little or no knowledge of maintenance of their dentures. This could be attributed to dental practitioners' failure to adequately educate the patient regarding the availability of different methods of cleansing /disinfecting dentures, the post insertion complications and systemic implications of a poorly maintained dentures. This scenario is widely prevalent due to dentist unawareness of the different disinfecting techniques, lack of quality time for individual patient care, patient's inability to implement the disinfection and patient's negligence of maintaining denture hygiene.

MATERIAL AND METHODS

Pubmed, Google Scholar, OpenJGate, Web of Science data bases were searched for relevant articles using the key words "denture disinfectants", "disinfecting dentures". Article search was done from the year 1980 to 2017. Both soft copy and hard copies were gone through for all the 61 articles obtained from the search. Only those articles which described chemical (synthetic) disinfectants were included in the review process. The total number of articles which fitted in the criteria were 38.

Classification

Denture cleansers can be classified as:

1) According To Type

- a) Creams¹
- b) Pastes^{1,2}
- c) Gels and solutions.
- d) Tablets³

2) According to the mode of action

- a) **Alkaline peroxides⁴:** Examples include:
 - i. Efferdent, Warner-Lambert, NJ,USA
 - ii. Polident, Alkaline-peroxide Block Drug, NJ,USA
 - iii. Steradent triple action, Reckitt and Colman Ltd, NJ,USA,
 - iv. Corega Tabs, GlaxoSmithKline Brazil, Sao Paulo, SP, Brazil.

Peroxides become alkaline solutions of hydrogen peroxide when dissolved in water. Alkaline peroxide cleansers are effective in dissolution of plaque because of its effect on the plaque matrix and is both bactericidal and fungicidal.^{5,6,7,8}

Efferdent alkaline peroxide denture cleanser soak caused a significantly greater reduction of microorganisms¹ especially mutans group of streptococci and aerobes³ than did brushing with denture paste.

But, Alkaline-peroxide denture cleansers were found to be less effective when compared to ultrasonic denture cleanser which only used water as the media.⁹

Hydrogen peroxide is one of these agents and can affect the vital structures of cells by means of in situ generation of the highly reactive hydroxyl groups.¹⁰

This category of denture disinfectants include the following:

- i. **Alkaline detergents:** They act by reducing surface tension.
- ii. **Oxidizing (bleaching) agents:** Alkaline perborate, sodium perborate (Fittydent Mega Cleansing Tablets, Fittydent International, Pinkafeld, Austria) or potassium monopersulfate¹¹
- iii. **Hydrogen peroxide¹¹:** 3% hydrogen peroxide is taken in a small container and the **dentures** are soaked in the solution for 30 minutes. Then, brush them with

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toothpaste to remove any unpleasant taste.

- b) Reducing Solutions:** e.g. Sodium hypochlorite¹² (e.g.0.5% Sodium Hypochlorite solution).

Other commercial products include:

- Mersene (Colgate-Palmolive Ltd., Dist New York, N.Y., United States of America),
- Kleenite (Regent labs, Deerfield Beach, FL, United States of America,
- Dentural (Martindale pharmaceuticals,Essex,United Kingdom),
- Milton (Mild sodium hypochlorite solution/household bleach),
- Mildent (Mild sodium hypochlorite solution).

Mode of action: Action of sodium hypochlorite is by directly acting on organic matrix of plaque causing dissolution of polymer structure.¹³ This solution is an alkaline hypochlorite which eliminates denture plaque effectively even after short-term exposure because of the presence of undissociated hypochlorous acid (HOCl), where the concentration depends on pH, and which oxidases sulphhydryl (-SH) of amino acids and proteins to the disulphide form (S-S).¹⁴

In one study authors have noted that sodium hypochlorite exhibited marked bactericidal activity.¹⁵ and was superior to all the other denture cleanser and have recommended not to soak the denture for more than 10 minutes.¹⁶ In another study, a 0.5% sodium hypochlorite was effective in controlling denture biofilm.^{15,17}

Mersene and new Kleenite show 57% stain removal ability.¹⁸

Chlorox-calgon solution(mixture of sodium hypochlorite and sodium hexametaphosphate).

Clorox-Calgon proved to be as effective as Mersene in removing plaque. The disadvantage of Clorox-calgon is that it has an unpleasant odour.¹⁹ Clorox-Calgon accomplished sterilization against a variety of microorganisms, including a spore-forming bacteria and C.albicans.²⁰ It was found that Clorox-Calgon were effective at killing yeast under in vitro conditions, but were not effective under clinical conditions.²¹

- c) Chlorhexidine:** e.g.0.2% chlorhexidine gluconate (Parmason Shining, Taipei, Taiwan).²²

Mode of action: It has both bacteriostatic and bactericidal mechanisms of action, depending on its concentration. Chlorhexidine kills by disrupting the cell membrane.

Chlorhexidine 0.2% was most effective when compared to sodium hypochlorite.¹⁵ However, 2% chlorhexidine gluconate solution exhibited a higher antimicrobial effect on the denture biofilms.²³

- d) Mild Dilute acids:** E.g.Solutions of hydrochloric or phosphoric acid (3 to 5% hydrochloric acid or combination of hydrochloric and phosphoric acid)²⁴

Mode of action: Primarily acts on inorganic phosphates and stains.¹³

- e) Effervescing agents:** E.g. Perborate, (Fittydent Mega

Cleansing Tablets,Fittydent International, Pinkafeld, Austria carbonate)¹¹ or citric acid.

Mode of action: Effervescing agents provide for the rapid disintegration of the product and also create a mechanical cleansing action. Citric acid acts by removing stains.

Other Commercially available products: Efferdent, Warner-Lambert, NJ, USA

New Efferdent showed the lowest effectiveness in removing stain which was only 26%. In another study it was ascertained that Fittydent was found to be more effective than polident and efferdent in reducing candida albicans after 60min of immersion.²⁵

- f) Chelating agents:** E.g. EDTA. (ethylenediamine tetraacetic acid or Versene acid).

Mode of action: This type of compound helps to remove the tartar that has accumulated on a denture's surface.

- g) Detergents:** E.g. Sodium polyphosphate.

Mode of action: acts by reducing the surface tension.

Commercially available products: Clinsodent, ICPA Health products, India)

- h) Enzymes:** Eg: Protease (papain), Amylase²⁶ (gluco-amylase).

Mode of action: Enzymes act on glycoprotein, mucoprotein, and extracellular polysaccharide structures, resulting in the breakdown of macromolecules into less adhesive structures.

Commercially available products: DC- 1 (Pika). It contains the lytic enzyme B-1, 3- gluconase which acts against the fungal cell wall (31). Enzyme formed chemical cleanser was superior to the other cleanser James N. E. Connor (1977)¹³

- I) Additional compounds: Dye markers** (1% neutral red)¹², fragrances and flavorings

Mode of action: Dye markers that provides a color change when the cleansing process has been completed. Flavorings and fragrances are to make the denture pleasantable after the disinfection procedure.

- J) Disinfectants:** E.g.Potassium permanganate, Gluteraldehyde (Cidex,Johnson and Johnson, NJ, USA. In a study,the disinfection potential of 2% Gluteraldehyde was better than Electrolyzed Acid Water when the specimens were disinfected for 1 and 3 min.²⁸

- K) Ozone:**

Mode of action: attributed to lethal oxidation of bacterial protoplasm, membrane oxidation followed by lysis, cell electron transfer or capture thus irreversibly altering the buffering mechanism and membrane alteration.

The addition of ozone to an ultrasonic cleaning system containing different experimental solutions resulted in antibacterial activity against S. aureus.²⁹

- L) 100% Vinegar:**

Mode of action: Low concentrations of acetic acid were shown to be able to inhibit growth of all strains, prevent them from forming biofilms and also to eradicate mature biofilms

for all isolates after three hours of exposure.

Commercially available products:

The immersion of complete dentures in 100% vinegar solution, during the night, reduced the counts (cfu/mL) of *Candida* spp. in saliva and the presence of denture-induced stomatitis.³⁰

M) Denture Wipes: Example: a)Dentist On Call Denture Wipes (Majestic Drugs Company), b)ProClean Adequate disinfection may not be reached with this quick-fix cleaning methods.

DISCUSSION

An ideal denture cleanser should be simple to use, effectively remove organic and inorganic matter from denture surface, have bactericidal and fungicidal properties and should cause least amount of damage to the denture base.³¹ Chemical agents for denture cleansing have the advantage of being simple to use and several studies have shown their efficacy in reducing biofilm formation *in vitro*^{32,33,34} and *in vivo*.^{35,36} Many patients in long-term care hospitals cannot adequately brush their dentures because of disease, dementia and poor manual dexterity. Such inadequate cleaning may allow for the growth of *Candidal* and bacterial spp., which could serve as reservoirs for disseminating infections. According to several studies, the use of denture cleansers significantly reduced the number of microorganisms on dentures in patients, especially in a hospitalized geriatric population.³⁶ Various studies, show positives and possible negatives with the use of denture cleansers. Investigations and studies have pointed out that, the correct use of chemical cleansers is not associated to alterations in mechanical properties of denture base materials.^{37, 38} Allergy or harmful effects by the proper use of cleansers following manufacturer's direction have also not been reported.

CONCLUSION

Educating the patient in denture hygiene is vital. Dentists must continually learn about the chemical content of products used at work. Awareness of any new symptoms and proper guidance to our patients should be stressed more as denture cleansers are a part of the daily life of almost all the denture wearers. Dental professionals must take responsibility of patients' health even after treatment by adopting review appointments especially to observe the oral and denture hygiene.

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