

Comparison of the Effectiveness of Sodium Hypochlorite and Dentamize Tablet for Denture Disinfection

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Abstract: Poor oral hygiene results in accumulation of dental plaque and dental biofilms, especially in elderly with denture. Regular cleaning of the dentures using chemical or physical methods can minimize the risk of periodontal disease such as denture related stomatitis in denture users. The aim of the study was to compare of the effectiveness of two chemicals, Sodium hypochlorite and Dentamize tablets, with or without brushing for cleaning of dentures. Initially, 56 complete denture including 28 old and 28 new dentures was chosen for this study. Denture (old and new) decontaminated with sodium hypochlorite 0.5% and Dentamize tablet solution both with and without brushing for 4 different incubation periods. The denture microbial load before and after decontaminations was determined by culturing on appropriate media. Fisher exact test was used for comparing results with the level of significance less or equal to 0.05. All of the dentures, particularly the old ones, had both pathogenic and non pathogenic organisms before disinfection. Sodium hypochlorite was more effective than Dentamize in reducing the load of microbial flora in all incubation times ($P=0.001$) and brushing increased their cleaning effect. All of new dentures were completely cleaned after 40 minutes with Sodium hypochlorite while only 64.3% of dentures were cleaned with Dentamize solution. Older dentures have higher microbial contamination and longer time is needed to disinfect them. Sodium hypochlorite is more effective than Dentamize tablet and brushing improves cleaning of dentures to reduce the load of microbial flora. The use of effective denture disinfectants such as sodium hypochlorite 0.5% was significantly reduced the dentures microorganisms in denture users' population and improved their oral health care.

Key words: Denture % Disinfection % Sodium hypochlorite % Dentamize tablet

INTRODUCTION

In human mouth dentures as an indwelling medical device, prepare an optimal environment for adhesion and multiplication of both pathogenic and non pathogenic organisms. The increasing use of dentures has led to a concomitant increase in the incidence of denture stomatitis. Management of denture related infections is challenging and infected dentures generally need to be dis-infected [1]. The increasing use of dentures in senile and institutionalized adults, who are prone to stomatitis and other infections, has caused increasing the denture related infections [2]. Denture stomatitis is one of the denture related infections, caused by the predominant species specially *Candida albicans* and few

streptococcus species [3,4]. Also, inadequate cleaning of dentures in elderly leads to growth of microbial agents and formation of biofilms, which are reservoirs of infection [5]. As denture related infections due to plaque and biofilms are significant, cleaning of dentures is critical and essential to prevent denture stomatitis and other denture related disorders [6]. The most important way to maintain healthy oral mucosa is proper cleaning and appropriate hygienic care of removable dentures. Though it is the responsibility of denture users, the dentists should inform patients about the various dis-infectants used for plaque control [7]. The aim of this study was to evaluate and compare the anti microbial effects of Sodium hypochlorite 0.5% and Dentamize tablets at different incubation time periods with and without brushing.

MATERIALS AND METHODS

In the present study, 56 maxillary dentures including 28 old (older than 5 years) and 28 new (used for less than 6 months) were included in the study. Dentures that used from more than six months till less than 5 years and also, dentures of people, who had diabetes and malignancies were excluded in current study. The proposal of this research was examined and approved by the ethical committee of the University of Yazd medical sciences and health services.

Both the new and old dentures were divided into two groups having similar criteria in respect to period of usage and sex of users. Sodium hypochlorite 0.5% (Whitex, Iran) was used in one group, while Dentamize tablet solution (2 tablets dissolved in 150 ml distilled water as directed by the producer) was used for the second group. Before dis-infection, the microbial flora was identified by cultivating the denture surface scrubs on Tripticase broth media and Sabouraud dextrose agar (Merk, Germany). Isolated colonies were identified microscopically and using different biochemical diagnostic tests. The dentures were incubated in the two media for a period of 20, 40 and 60 minutes. After all incubations, the dentures were washed in sterile distilled water and their scrubs cultured for identification of the microbial flora after dis-infection. Results were evaluated using SPSS 13.5 software program and Fishers exact test was used for statistical analysis. Differences were considered statistically significant when $p < 0.05$.

RESULTS AND DISCUSSION

All of the dentures had at least one and a maximum of 4 microbial species at the start of the study. The isolated microbes included; *Klebsiella pneumoniae*, *Candida albicans*, *Candida* sp. *Enterobacter agglomerence*, saprophyte *Corynebacteria*, gram positive bacilli and *Staphylococcus*. After 20 minutes of soaking the old dentures in the both solutions, 14 (50%) of the dentures, which soaked in Dentamize solution had at least one microbial contamination, whereas only 6 (21.4%) of them, which soaked in sodium hypochlorite were contaminated. After 40 minutes of soaking the dentures in the two solutions, 3 (10.7%) of the dentures soaked in sodium hypochlorite was positive but 14 (50%) of the dentures soaked in Dentamize solution had at least one microbial contamination ($P=0.0014$). After 60 minutes of soaking the dentures in the two solutions, all dentures,

Table 1: Comparison of the two types of dis-infectants in old denture with brushing or not and in different incubation periods

Disinfectant	Sodium		P _{val} (fisher exact test)
	Hypochlorite	Dentamize	
	No of positive (Percent)	No of positive (percent)	
Old dentures			
Without brushing			
20 minutes	6	14	0.0037
40 minutes	3	14	0.0014
60 minutes	0	13	0.0002
With brushing			
20 minutes	5	14	0.0033
40 minutes	1	12	0.0014
60 minutes	0	8	0.0017

The total no.= 28, P_{val} can be conducted by t-test

Table 2: Comparison of the two types of dis-infectants in new denture with brushing or not and in different incubation periods

Disinfectant	Sodium		P _{val} (fisher exact test)
	Hypochlorite	Dentamize	
	No of positive (Percent)	No of positive (percent)	
New dentures			
Without brushing			
20 minutes	3	13	0.0013
40 minutes	0	10	0.0014
60 minutes	0	7	0.0002
With brushing			
20 minutes	0	10	0.0033
40 minutes	0	6	0.0014
60 minutes	0	3	0.0017

The total no.= 28, P_{val} can be conducted by t-test

which soaked in sodium hypochlorite was de-contaminated and there was no microbial positive denture though 13 (46.4%) of the dentures soaked in Dentamize solution had positive microbial contamination ($P=0.0002$). Brushing led to reduction in the microbial contamination rates in all incubation times for both dis-infectants (Table 1). In new dentures also sodium hypochlorite was more effective than Dentamize solution in all incubation times with or without brushing as seen in Table 2. The contamination of the old dentures was more than the new ones at different incubation times (Figure 1).

Many studies have been performed about etiological agents of denture stomatitis and controlling methods of these infections [8-11]. The most common etiological agents are *Candida*, especially *C. albicans* and streptococcus strains [10]. There are a wide brands of commercially prepared products for

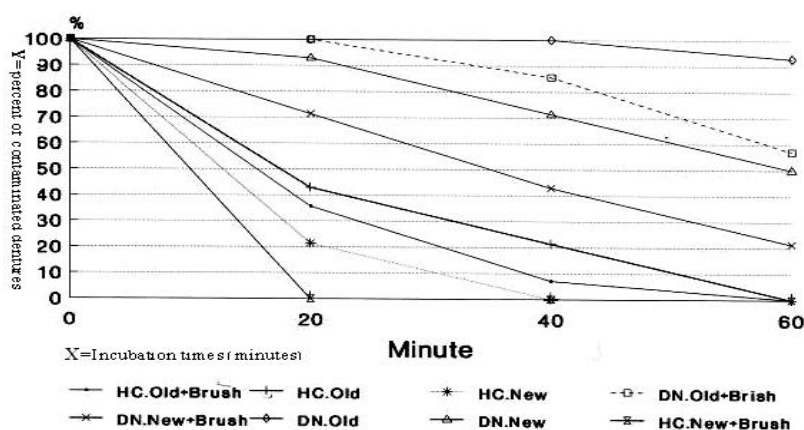


Fig. 1: Disinfection of new and old dentures in different incubation times with sodium hypochlorite and Dentamize solution

Figure legends:

HC= Sodium Hypochlorite DN=Dentamize tablet solution

HC.old+brush= old dentures soaked in sodium hypochlorite and brushed

DN.New+brush= new dentures disinfected in Dentamize tablet solution and brushed

HC.new= new dentures disinfected with sodium hypochlorite

DN.new= new dentures disinfected with Dentamize tablet solution

cleaning and decontamination of dentures with or without mechanical and physical methods [8,9,12]. Sodium hypochlorite is one of the commonly used cleansers and 0.05% solution along with coconut soap for brushing of dentures increases its anti microbial activity significantly and also reduces the clinical signs of denture stomatitis [13].

In the present study, both groups were matched for age and sex, though there was an overall predominance of older individuals as expected. The number and variety of microorganisms in older dentures was more than new dentures, which represented the importance of cleaning and dis-infecting old dentures. *C. albicans* was isolated from 57% of old dentures, whereas it was isolated in only 7% of new dentures. It is possible to clean and brush new well polished dentures with common cleansers, but it seems that as the dentures become older, more powerful disinfectants are needed. Sodium hypochlorite was more effective than Dentamize solutions for dis-infection of both old and new denture in different incubation times (Tables 1 and 2) and brushing of dentures in both solutions increased their ability for cleaning of dentures. Sodium hypochlorite with brushing after 40 minutes resulted in decontamination of 96.4% of old dentures, while 89.3% of dentures without brushing after 40 minutes were decontaminated in the current study.

On incubating the dentures for 60 minutes in sodium hypochlorite 0.5% with or without brushing, all of the dentures were completely decontaminated (Table 1) whereas 46.4% of old and 25% of new dentures, which cleaned with Dentamize solution were contaminated after one hour. For complete dis-infection of old dentures with 0.5% sodium hypochlorite, 60 minutes were needed, whereas all new dentures were cleaned after 40 minutes in the present study. Rudd *et al.* [14] Rudd and Senia [14] reported that all the dentures were disinfected after soaking them for 5 minutes in 5.25% sodium hypochlorite. However the higher concentration of the chemical in Rudd's study resulted in reduction of incubation time for complete sterilization as compared to the present study but this concentration was changed the normal color and roughness of dentures as a disadvantage of this concentration. In the Kulak study [15], Kula *et al.* [15] no statistical relationship was reported between denture stomatitis and frequency of brushing. Microwave irradiation can also be used for cleaning and reduction of residual microorganisms on dentures. Webb and Thomas reported that irradiation of maxillary acrylic dentures using microwave (2450 MHz, 350 W) was more effective than Sodium hypochlorite (0.02% and 0.0125%) in controlling biofilm formation, particularly by *S. gordonii* [3].

However, in another study Webb *et al.* [16] reported that both sodium hypochlorite and irradiation significantly reduced the load of *Candida* and aerobic bacteria on maxillary and mandibular dentures and microbiological analysis showed that there was no significant difference between the two methods. Pavarina *et al.* [17], compared 1% sodium hypochlorite, Biocide, Alkaline peroxide and 4% Chlorhexidine gluconate for disinfection of dentures and concluded that immersion for 10 minutes in 1% Sodium hypochlorite and 4% Chlorhexidine gluconate was useful for reducing the infection of dentures.

As the alkaline peroxide solutions may not be compatible with certain permanent or temporary resilient materials, patients are cautioned to minimize the time period they soak their soft lined dentures [18]. Nakamoto *et al.* [19], concluded that efficacy of Sodium hypochlorite against *Candida* was inferior to the action of alkaline peroxide compounds. In the present study, Dentamize tablet having an alkaline peroxide component did not reduce the load of *C. albicans*. Dentamize tablet solution was more effective in disinfecting new dentures as compared to old dentures, which could be due to less formation of deposits in new dentures as compared to old dentures.

CONCLUSION

Within the limitations of the study, the following conclusions were drawn:

- C All of the dentures were contaminated prior to the study and the level of contamination was higher in the older dentures as compared to the new ones.
- C Sodium hypochlorite 0.5% was more effective than Dentamize tablet and incubation for 40 minutes with brushing and 60 minutes without brushing completely cleaned the dentures.
- C Brushing resulted in better disinfection and cleaning of dentures with both the disinfectants.
- C However Sodium hypochlorite is as useful and cheap disinfectant for cleaning of dentures but concentration more than 2% can change the color and roughness of dentures.

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