Med. J. Cairo Univ., Vol. 62, No. 1, March: 31 -38, 1994

The Effect of Dentures on Oral Flora and the Efficacy of Three Different Denture Cleansers

M. AMR EL KHOLY, Ph.D.; MONA A. GHARIB, Ph.D.; SAMIRA I. IBRAHIM, M.D.; MOHAMED A.M. NADA, M.D. and HANY RAMZY, M.Sc.

The Microbiology Department, Faculty of Medicine and the Prosthodontics Department, Faculty of Oral and Dental Medicine, Cairo University and Maadi Armed Forces Hospital.

Abstract

In a study performed on 40 completely edentulous males wearing dentures from scratch, alkaline peroxidases cleansers (Dr. Kleen and Coriga tablets) were superior than alkaline hypochlorite (Clorox). Regular cleanser use affects the total oral flora as well as Strept mutans. Dentures' wear is accompanied by the appearance of Strept mutans in the oral cavity.

Introduction

DENTURES enhance accumulation of food debris as well as the formation of denture plaques [1]. Both trigger denture induced stomatitis "sore mouth" [2]. The denture plaque pathogenesis depends mainly upon its microbial content [3] and it resembles dental plaque in its composition and method of anchorage [1,4]. Strept mutans play a cornerstone role in dental caries through glucan production which in turn glues the organism to tooth surfaces, along with other trapped organisms can produce acid fermentation products that dissolve tooth enemal [4].

Dentures cleanliness represents a major problem to wearers. Dentures cleansing could be achieved mechanically either by brushing, sonic or ultra sonic cleansers to dislodge the deposits or chemically to dissolve it [2].

The market is stuffed with many chemical cleansers and their manufacturers claim there efficiency. This study is conducted to verify the efficiency of three different commercially available dentures cleansers and their effects on the oral mucosa and flora as well as the effect of dentures on oral flora.

Patients and Methods

Forty completely edentulous males, age ranging from 53-59 years (mean 57.4 years) were selected from the prosthetic clinic of Maadi Armed Forces hospital and the out patient clinic of El-Zahraa Armed Forces. Patients were free from any systemic diseases that might affect the oral flora e.g. diabetes mellitus, fever and nutri-

tional deficiencies. Former denture wearers and cases with extremely thin covering mucosa were excluded. The oral mucosa of all cases were free from any signs of inflammation, ulcers or hyperplasia. Cases with extremely resorbed ridges and severe undercuts were also excluded; 6 month lapse from the last extraction was a must. All cases were nonsmokers and non alcoholics.

Dentures constructions: Acrylic dentures were constructed according to the technic followed in the prosthetic department of Faculty of Oral and Dental Medicine, Cairo University.

Dentures cleansers: 3 different commercially available cleansers were subjected to the study.

1- Dr. Kleen's: powder containing perborate as peroxide source.
2- Corega tablets: effervescent tablets containing hydrogen peroxide as source of oxygen.
3- Sodium hypochlorite solution prepared by dilution of the commercial clorox 1:3 [5].

Cases were instructed to soak their denture in the cleanser solution overnight then wash it by running tap water prior to wearing it.

Clinical methodology: Inspection of the supporting mucosa was done for any inflammatory signs. Inflammation is ranked as: No, slight and severe.

Microbiological methodology: Saliva were collected in sterile wide mouth universal containers. Serially diluted saliva were plated on to blood agar aerobically for total microbial count and on Mitis salivarius medium (Difco) supplemented with 20% sucrose and 0.2 units/ml bacitracin for Strept mutans "Mitis sucrose bacitracin" [7], plates were incubated at 35°C for 72 hrs. in a candle jar [8]. Count is expressed as colony forming unit (CFU)/ml.

Sampling and clinical assessment intervals:

M0: Before insertion of dentures.
M1: 1 month after insertion and before the use of cleanser.
M2: 2 months after insertion and 1 m after the use of cleanser.
M4: 4 months after insertion and 3 m after the use of cleanser.
M7: 7 months after insertion and 6 m after the use of cleanser.

Statistical analysis was carried out by an IBM-PC using SAS program. Paired *t* test and one way analysis of variance (Proc ANOVA) are displayed.

Cases were divided into 4 groups (10 each), each group was insrtructed to use only their specified cleanser, control group used nothing.

Group 1: Dr. Kleen.
Group 2: Corega tablets.
Group 3: Clorox.
Group 4 Control.

Results

Fig. 1 shows the clinical assessment of the oral mucosa during the 6 month period of the study.

Means of the total CFU /ml are shown in Table 1 and Fig. 2, paired *t* -test values are shown in table 2.

Means of Strept CFU /ml are shown in table 3 and Fig. 3, paired *t* -test values are shown in Fig. 3.

Percentage of Strept mutans to total CFU /ml is shown in table 5.

Table (1): Mean of the Total CFU /ML.

	Mean x 10 a	Interval	d	SD x 10a	SE x 10a
		M 0			
Group 1	0.138		a	0.008	0.002
Group 2	0.138		a	0.008	0.002
Group 3	0.138		a	0.008	0.002
Group 4	0.138		a	0.008	0.002
		M 1			
Group 1	4		a	1.471	0.465
Group 2	3.7		a	1.619	0.512
Group 3	2.465		a	1.659	0.524
Group 4	3.7		a	1.619	0.512
		M 2			
Group 1	2.525		a	0.984	0.311
Group 2	2.805		a	1.083	0.342
Group 3	2.415		a	1.545	0.488
Group 4	3.741		a	1.653	0.523
		M 4			
Group 1	0.94		a	0.341	0.107
Group 2	1.695		ab	0.702	0.222
Group 3	2.015		b	0.323	0.412
Group 4	3.742		c	1.669	0.528
		M 7			
Group 1	0.475		a	0.261	0.082
Group 2	0.925		ab	0.409	0.129
Group 3	1.565		b	1.152	0.364
Group 4	3.743		c	1.658	0.524

d : Least significant difference between groups
a, b and c : Mean with no common letters differs significantly
SD : Standard deviation
SE : Standard error

Table (2): Paired *t* -test for Total CFU/ML.

	Mean d. x 10^8	Interval	SED x 10^8	*t* -value	*p*
		M 0 - M 1			
Group 1	3.862		0.464	8.312	**
Group 2	4.012		0.380	10.532	**
Group 3	3.077		0.502	6.125	**
Group 4	3.562		0.511	6.961	**
		M 1 - M 2			
Group 1	1.195		0.229	5.216	**
Group 2	1.75		0.260	4.507	**
Group 3	0.35		0.089	3.913	**
Group 4	0.05		0.037	1.340	NS
		M 2 - M 4			
Group 1	1.110		0.176	6.283	**
Group 2	1.585		0.292	5.415	**
Group 3	0.4		0.108	3.685	**
Group 4	0.001		0.049	0.020	NS
		M 4 - M 7			
Group 1	0.77		0.129	5.592	**
Group 2	0.645		0.083	5.647	**
Group 3	0.45		0.079	5.654	**
Group 4	0.001		0.025	0.387	NS

Mean d. = Mean of the difference
SED = Standard error of the difference
* = Significant at $p < 0.05$
** = Significant at $p < 0.001$
NS = Not significant

Table (3): Mean of Strept, Mutans CFU/ml.

	Mean x 10^b	Interval	d	SD x 10^6	SE x 10^6
		M 0			
Group 1	-		-	-	-
Group 2	-		-	-	-
Group 3	-		-	-	
Group 4	-		-	-	
		M 1			
Group 1	1.5		a	0.745	0.235
Group 2	1.315		a	0.812	0.257
Group 3	1.43		a	0.863	0.273
Group 4	1.5		a	0.745	0.235
		M 2			
Group 1	0.89		a	0.484	0.153
Group 2	1.155		a	0.680	0.215
Group 3	1.095		a	0.632	0.200
Group 4	1.515		c	0.714	0.255
		M 4			
Group 1	0.655		ab	0.415	0.131
Group 2	0.395		b	0.216	0.068
Group 3	0.965		a	0.761	0.240
Group 4	1.592		c	0.726	0.229
		M 7			
Group 1	0.365		a	0.311	0.098
Group 2	0.155		a	0.086	0.027
Group 3	0.74		b	0.619	0.196
Group 4	1.6		c	0.764	0.024

Table (4): Paired *t* - *test* for Strept Mutans CFU /ml.

	Mean d x 10^6	Interval	SED x 10^6	*t* value	
		M 0 - M 2			
Group 1	0.345		0.138	2.497	*
Group 2	0.425		0.175	2.426	*
Group 3	0.335		0.083	4.019	**
Group 4	0.015		0.031	0.473	NS
		M 2 - M 4			
Group 1	0.5		0.100	4.972	**
Group 2	0.495		0.110	4.493	**
Group 3	0.13		0.079	1.692	NS
Group 4	0.075		0.024	3/078	**
		M 4 - M 7			
Group 1	0.29		0.041	7.01	**
Group 2	0.240		0.068	3.496	**
Group 3	0.225		0.058	3.857	**
Group 4	0.008		0.027	0.287	NS

Table (5): Paired of Strept Mutans to Total CFU /ml.

	Mean	Interval	d	SD	SE
		M 1			
Group 1	0.425		a	0.253	0.08
Group 2	0.387		a	0.17	0.053
Group 3	0.541		a	0.109	0.034
Group 4	0.673		a	0.629	0.199
		M 2			
Group 1	0.437		a	0.211	0.067
Group 2	0.403		a	0.22	0.067
Group 3	0.499		a	0.13	0.041
Group 4	0.56		a	0.472	0.149
		M 4			
Group 1	0.403		a	0.177	0.056
Group 2	0.452		a	0.255	0.08
Group 3	0.488		a	0.143	0.045
Group 4	0.592		a	0.515	0.163
		M 7			
Group 1	0.388		a	0.261	0.082
Group 2	0.367		a	0.148	0.046
Group 3	0.496		a	0.162	0.051
Group 4	0.607		a	0.557	0.176

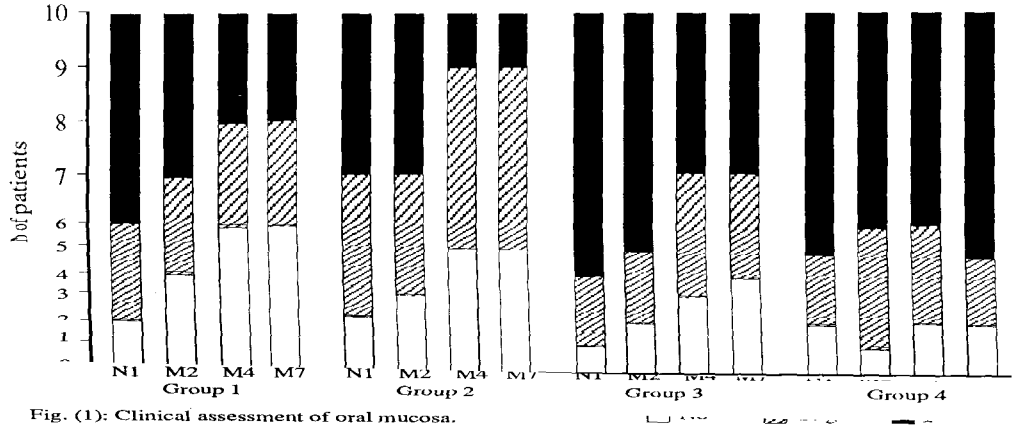

Fig. (1): Clinical assessment of oral mucosa.

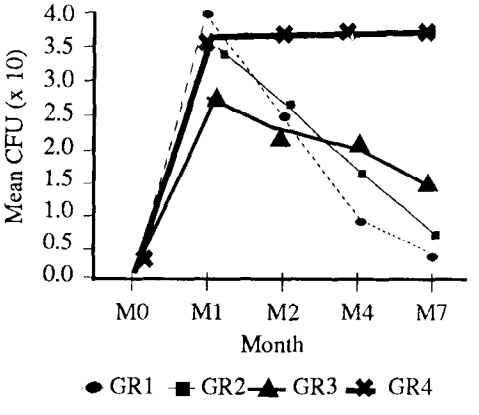

Fig. (2): Mean of total CFU /ml.

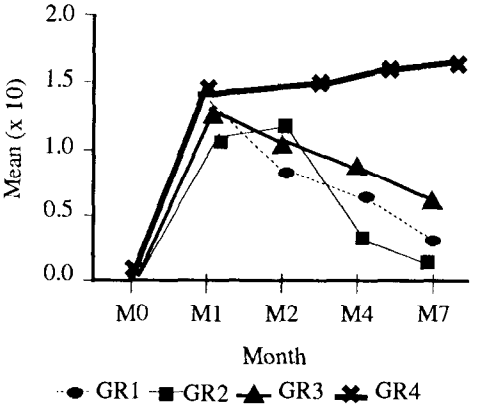

Fig.(3): Mean of strept mutans /ml

Discussion

After wearing complete dentures for one month, a significant increase in the oral flora together with the appearances of Strept mutans was noticed. Strept mutans was completely absent from the oral cavity before dentures. Many investigators concluded the same observation [8,9,10]. Microporosities in the acrylic resin surface of dentures provocate the formation of salivary pellicles which enhance bacterial colonization and alteration of the oral flora [11,12,13].

The inflammation observed after wearing dentures is attributed to the change in the oral environment with subsequent alteration in the oral flora.

Although after cleansers use a gradual decrease in the total CFU as well as in Strept mutans is quite obvious, yet, Dr. Kleen's and Corega tablets were superior than sodium hypochlorite. The improvement of the oral mucosa during the follow up period and after cleanser use is attributed to the removal of denture plaques, debris and stains, thus reducing the incidence of inflammation. The statistically insignificant difference between Dr. Kleen and Corega tablets is due to their similar mode of action and their almost similar active ingredients.

We can conclude that the alkaline peroxidases assessed in the study - through their oxygen liberating mechanism which loosens debris, remove light stains and have an antibacterial activity; besides being an alkaline detergent acts also as a protein solubilizer increasing the cleansing activity - are superior than alkaline hypochlorite solution which removes light stains and debris with a bleaching action, many investigators [1,14,15] agree with us but on the other hand few ranks the hypochlorite first [16]. It is worthy to mention that all cleansers reduced the Strept count at the same rate of reduction of the total as there was no special effect on Strept mutans alone.

References

1- ABELSON D.C.: Denture plaque and denture cleansers Prosthet. Dent. J., 45: 376-380, 1981.

2- TARBET W.G.: Denture plaque quit destroyer. Prosthet. Dent. J., 48: 647-650, 1982.

3- BATES J.F. and ADDY M.: Partial dentures and dental plaque accumulation. J. Dentistry, 6: 285-288, 1978.

4- SCHERP H.W.: Dental caries: Prospects for prevention. Science, 173: 1199-1205, 1971.

5- NICHOLSON R.J., STORK M.M. and SCOTT H.E.: Calculus and stain removal from acrylic resin dentures. Prosthet. Dent. J., 20: 326-330, 1968.

6- GOLD G.O., JORDAN V. & VANHOUTE J.: A selective medium for Strept mutans. Arch. Oral Biol., 18: 1357-1359, 1973.

7- EMILSON C.G. and BRRATTHALL D.: Growth of Streptococcus mutans on various selective media J. Clin. Microb., 4: 95-99, 1976.

8 MIHALOW M.D. and TINANOFF N.: The influence of removable partial dentures on the level of Strept mutans in saliva Prosthet. Dent. J., 59: 65-69, 1988.

9 CARLSSON J., SODERHOLM G. and ALMFEDT I.: Prevalence of Strept sanguis and Strept mutans in the mouth of persons wearing full dentures. Arch. Oral Biol., 14: 243-247, 1969.

10 THEILADE E., BUDTZ J.E. and THEILADE J.: Predominant cultivable microflora of plaque on removable dentures patients with healthy oral mucosa. Arch. Oral Biol., 28: 675-680, 1983.

11- BUDTZ J.E., THEILADE E. and THEILADE J.: Quantitative relationship between yeasts and bacteria in denture induced stomatitis. Scand. J. Dent. Res., 91: 134-136, 1983.

12- EDGERTON M., TABAK A.L. and LEVINE J.M.: Saliva: A significant factor in removable prosthodontic treatment. Prosthet. Dent. J., 57: 57-60, 1987.

13- VANREENEN J.F.: Microbiologic studies on denture stomatitis. Prosthet. Dent. J., 30: 493-498, 1973.

14- REQUA - CLARK B.: Denture cleansers: council on dental materials, instruments and equipments. JADA, 106: 77-87, 1983.

15- DILLS S.S., OLSHAN A.M., GOLDNER S. and BRAGDON S.: Comparison of the antimicrobial capability of an abrasive paste and chemical soak denture cleaners. Prosthet. Dent. J., 60: 468-472, 1988.

16- ALTMAN M.D.: A spectrofluoremetric protein assay of plaque on dentures and of denture cleaning efficacy. Prosthet. Dent. J., 42: 502-509, 1979.