Chlorhexidine gel and Steradent® employed in cleaning dentures

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It was the purpose of the study to test the efficacy of brushing with a 1% chlorhexidine gel or a commercial solution cleanser (Steradent®) in preventing formation of plaque on the fitting surface of new dentures. The study group consisted of 74 denture wearers with denture stomatitis who were assigned randomly to one of four treatment groups, testing either the chlorhexidine gel, a placebo gel, Steradent®, or a placebo solution. The experiment was started immediately after denture treatment was completed. The experimental period was 1 month. The amount of denture plaque, the clinical condition of the palatal mucosa, and the concentration of yeasts in mucosal and denture smears were recorded while the patients used their original dentures and after the experimental period. Plaque had formed on all new dentures but to a smaller extent in the groups testing the chlorhexidine gel or the placebo gel. The study does not provide any obvious evidence of a chemical effect of chlorhexidine gel or Steradent® as a means to prevent formation of microbial plaque on the mucosal surface of maxillary complete dentures.

Key-words: Stomatitis; denture plaque; oral hygiene

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Infection, in particular by *Candida* species, is a significant cause of denture stomatitis (2, 16). The condition, which is found in about 60% of denture wearers, is primarily due to formation of microbial plaque on the fitting surface of the dentures (5, 7).

It seems that an efficient cleansing of the fitting surface of the maxillary denture is a key-factor in the maintenance of a healthy oral mucosa. Thus, healing of the lesions in the palate has been achieved by meticulous denture hygiene by mechanical plaque control (12) or by immersion of the dentures in solutions of chlorhexidine gluconate (4, 15). However, staining of the dentures was reported to be an obstacle for routine immersion of dentures in chlorhexidine.

It was the purpose of this study to investigate whether chlorhexidine in a more practical form – as a gel – might prevent plaque formation on new dentures thereby contributing to obtain a permanent healing of denture stomatitis. Steradent® was included in the study to compare the effect of a commercial, chemical denture cleanser with that of a placebo solution or plaque control by mechanical means.

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MATERIALS AND METHODS

Patients

Seventy-four denture wearers with the clinical signs of denture stomatitis were allocated randomly to one of four treatment groups, A, B, C and D. The groups were matched with regard to types of lesions and amount of denture plaque (Table 1). New dentures were made by students under supervision by clinical teachers. The final impressions for the dentures were taken in zinc-oxyde-eugenole paste. The teeth were set in balanced occlusion and articulation, acrylic teeth beeing used for the mandibular denture and porcelain teeth for the maxillary denture. A balanced occlusion was secured by selective grinding, if necessary after remounting the processed dentures in an adjustable articulator.

Treatment

Two dentifrices were tested, in group A a Hibitane® dental gel containing 1% chlorhexidine gluconate and in group B a placebo gel (ICI, Macclesfield, England), both displayed in coded tubes to ensure the double blind approach of the study. The placebo gel contained quinine sulfate to simulate the bitter taste of chlorhexidine. The subjects in group A and B were instructed to brush the dentures – in particular the fitting surface – carefully twice daily using the gel and a denture brush (Tandex®).

Two dissolvent tablets were tested, in group C an alkaline peroxide cleanser (Steradent®) and in group D placebo tablets (6). The patients were instructed to dissolve one tablet in 150 ml luke-warm water (37 °C), to soak the new denture for 15 min in a freshly prepared solution once daily, and to rinse the dentures in tap water before reinserting them into the mouth. No other change of the usual denture cleansing procedure was intended for groups C and D.

Gels or dissolvent tablets were delivered with the new dentures. The study was designed and carried out double blind.

Methods of examination

The patients were examined twice, i.e. before the denture treatment and after the new dentures had been worn for an experimental period of one month.

Clinical examination

The palate was photographed and the degree of palatal erythema established (3). Pre- and posttreatment photographs were compared and the therapeutic effect was graded (4). Denture cleanliness of the fitting surface of the maxillary denture was studied using a plaque detector (0.3% aqueous solution of proflavine monosulfate), and the denture was photographed.

The amount of denture plaque was graded as:

0, none visible;
+, less than 1/3 of the fitting surface of the denture;
++, covering 1/3–2/3 of the fitting surface;
+++, covering more than 2/3 of the fitting surface.

Plaque scores of the original dentures and the new dentures were compared blindly and differences were recorded.

Smears

Smears were prepared from scrapings from the fitting surface of the maxillary denture and the palatal mucosa (4). A measure of the concentration of yeast cells was made using Davenport's index (7). Comparison of pre- and posttreatment smears was made blindly (4).

The patients were encouraged to report any general or oral observations that might be related to the experiment.

Table 1. *Distribution of patients according to type of lesion and amount of denture plaque in the four treatment groups*

	Group	Type of lesion			Plaque score					
					Orig. dentures			New dentures		
		I	II	III	+	++	+++	+	++	+++
Chlorhexidine gel . . .	A	5	7	6	2	6	10	7	6	5
Placebo gel	B	4	7	8	3	6	10	4	8	7
Steradent®	C	4	7	7	4	8	6	4	7	7
Placebo tablets.	D	4	10	5	3	7	9	2	9	8

I: localized, simple lesion;
II: generalized, simple lesion;
III: papillomatous type of lesion.

Statistical analyses

Data obtained in the 4 groups of participants with the original and the new dentures were compared by means of the Chi-square test.

RESULTS

Denture cleanliness

Prior to the study none of the patients had been using commercial denture cleansers regularly, brushing with soap and water being the most common way of denture cleansing. Generally, denture cleanliness was poor as extensive plaque formation on the fitting surface of the dentures was found in most of the subjects (Table 1).

The four groups did not differ with regard to the distribution of plaque scores of the original dentures, i.e. the dentures which were worn before prosthetic treatment (Table 1). After having used the new dentures for one month, plaque had formed on the fitting surface of all dentures (Table 1). In group C and D plaque formation had been extensive and the plaque scores were of the same magnitude as those recorded on the original dentures (Fig. 1). Improved denture cleanliness was recorded more frequently in group A than in group C and D, $P < 0.01$.

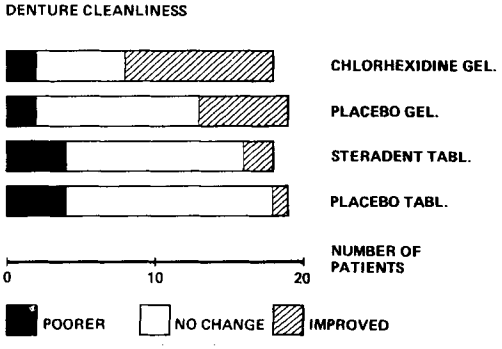

Fig. 1. Comparison of changes in clinical condition of the palatal mucosa after prosthetic treatment and daily denture cleansing for 1 month in the four treatment groups.

Inflammation

Before treatment all patients showed the clinical signs of denture stomatitis of varying severity (Table 1). After treatment complete healing was not noticed in any of the patients. However, the clinical condition of the palatal mucosa tended to improve more frequently in group A than in the other three groups, but the difference was not significant (Fig. 2).

Smears

By comparison of pre- and posttreatment smears considerable variations in the con-

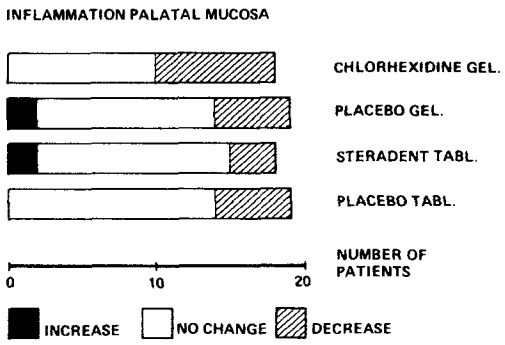

Fig. 2. Comparison of changes in amount of denture plaque after prosthetic treatment and daily denture cleansing for 1 month in the four treatment groups.

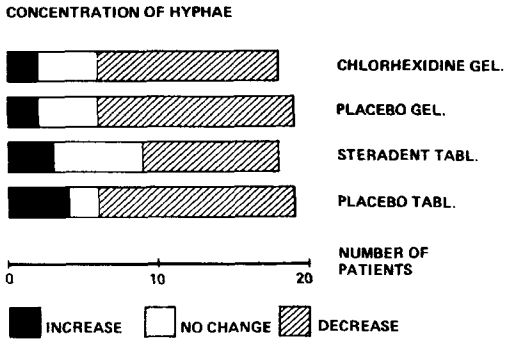

Fig. 3. Comparison of changes in concentration of yeast cells in oral smears after prosthetic treatment and daily denture cleansing in the four treatment groups.

centration of yeast cells were found (Fig. 3); however, by comparison between the groups significant differences were not recorded.

Side effects and complaints

Slight, brownish discoloration along the gingival margin of the artificial teeth had developed in most dentures in groups A and B. It was the general opinion that denture brushing with the gels was difficult because the gel adhered poorly to the denture-surface. No unwanted clinical side effects on the oral mucosa were observed in any of the groups.

DISCUSSION

In the present study the chlorhexidine containing gel (group A), used twice daily as a denture dentifrice, seemed to reduce the formation of new plaque on maxillary dentures as compared with a commercial solution cleanser (group C) or a placebo solution (group D); however, the chlorhexidine gel did not perform significantly better than the placebo gel (group B). The patients in group A and B had received careful instruction how to brush the dentures and were probably more motivated than the patients in groups C and D who were just told not to alter their usual denture brushing procedure and to use the solution cleanser once daily. There was no distinct correlation between plaque reduction and improvement of the clinical condition of the palatal mucosa; the reason may be that the clinical status of the mucosa might also have been influenced by the prosthetic treatment.

The study suggests that careful denture-brushing is a relatively efficient means in the control of denture plaque and that Steradent® has no apparent effect. This is in agreement with previous observations (6, 8, 12, 13). However, the study gives less obvious evidence that a 1% chlorhexidine gel exerts any chemical effect on denture plaque.

Tooth-brushing with chlorhexidine-containing dentifrices has been shown to reduce dental plaque formation but the effect on gingival status was less apparent (1, 9, 10, 11). The reason that no chemical effect of the chlorhexidine gel was detected in this study may have been that the yeast flora is relatively resistant to the action of chlorhexidine *in vivo* (4, 14), or that the plaque-inhibitory effect of chlorhexidine may have been masked by the mechanical cleansing of the dentures.

Discoloration of the dentures by chlorhexidine was not noticed by the denture wearers and seemed less pronounced as found in previous studies using a 2% solution of chlorhexidine for denture immersion (4). Moreover, the dentures kept their smooth and polished surfaces as the gel did not contain abrasive substances.

This study did not provide any obvious evidence of a chemical effect of chlorhexidine gel or Steradent® as a means to prevent formation of microbial plaque on the mucosal surface of maxillary complete dentures. On the other hand, new denture plaque had formed in all patients who had received careful instructions how to brush the dentures. The present study, therefore, emphazises the importance of developing an efficient chemical denture cleanser without harmful or unwanted side effects, which could be used as an adjunct to denture cleansing by mechanical means.

REFERENCES

1. Bassiouny, M. A. & Grant, A. A. The toothbrush application of chlorhexidine. A clinical trial. Br. Dent. J. 1975, 139, 323–327
2. Budtz-Jørgensen, E. The significance of Candida albicans in denture stomatitis. Thesis. Scand. J. Dent. Res. 1974. 82, 151–190
3. Budtz-Jørgensen, E. & Bertram, U. Denture stomatitis I. The etiology in relation to trauma and infection. Acta Odontol. Scand. 1970, 28, 71–92
4. Budtz-Jørgensen, E. & Løe, H. Chlorhexidine as a denture disinfectant in the treatment of denture stomatitis. Scand. J. Dent. Res. 1972, 80, 457–464
5. Budtz-Jørgensen, E., Stenderup, A. & Grabowski, M. An epidemiologic study of yeasts in elderly denture wearers. Community Dent. Oral Epidemiol. 1975, 3, 115–119
6. Budtz-Jørgensen, E. & Kelstrup, J. Enzymes as denture cleansers. Scand. J. Dent. Res. 1977, 85, 209–215
7. Davenport, J. C. The oral distribution of candida in denture stomatitis. Br. Dent. J. 1970, 129, 151–156
8. Glantz, P.-O., Hansson, L., Nyquist, G., Rundcrantz, A. & Rundcrantz, T. Effektiviteten hos några protesrengöringsmedel. Tandläkartidningen. 1975, 67, 795–797
9. Hansen, F., Gjermo, P. & Eriksen, H. M. The effect of chlorhexidine-containing gel on oral cleanliness and gingival health in young adults. J. Clin. Periodontol. 1975, 2, 153–159
10. Johansen, J. R., Gjermo, P. & Eriksen, H. M. Effect of 2-years' use of chlorhexidine-containing dentifrices on plaque, gingivitis, and caries. Scand. J. Dent. Res. 1975, 83, 288–292
11. Lennon, M. A. & Davies, R. M. A short-term evaluation of a chlorhexidine gel on plaque deposits and gingival status. Pharmacol. Ther. Dent. 1975, 2, 13–19
12. Lindquist, L., Andrup, B. & Hedegård, B. Proteshygien II. Klinisk värdering av ett hygienprogram för patienter med protesstomatitt. Tandläkartidningen. 1975, 67, 872–879
13. Nicholson, R. J., Stark, M. M. & Scott, H. E. Calculus and stain removal from acrylic resin dentures. J. Prosthet. Dent. 1968, 20, 326–329
14. Olsen, I. Denture stomatitis. Effects of chlorhexidine and amphotericin B on the mycotic flora. Acta Odontol. Scand. 1975a, 33, 41–46
15. Olsen, I. Denture stomatitis. The clinical effects of chlorhexidine and amphotericin B. Acta Odontol. Scand. 1975b, 33, 47–52
16. Olsen, I. Studies on oral yeast infections with emphasis on denture stomatitis. Thesis. Fabritius, Oslo. 1976