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Preventative Dentistry

Effect of amine fluoride/stannous fluoride toothpaste and mouthrinse on dental plaque accumulation and gingival health

M Madléna[1], C Dombi[2], Z Gintner[1], J Bánóczy[3]

[1]*Department of Prosthodontics;* [2]*Second Department for Education;* [3]*Department of Oral Biology, Faculty of Dentistry, Semmelweis University, Budapest, Hungary*

OBJECTIVE: The aim was to investigate the influence of amine fluoride (AmF)/stannous fluoride (SnF_2) containing toothpaste and mouthrinse on plaque accumulation and gingival health of young adults after 4 weeks use.

SUBJECT AND METHODS: Forty-two young adults (mean age: 28.33 ± 7.19 years) were examined for the Plaque Index (PI; Silness and Löe, 1964) and Gingival Index (GI; Löe and Silness, 1963) scores, and divided randomly into two groups. Both groups used AmF/SnF_2 containing toothpaste twice a day for 3 min toothbrushing, and one group after toothbrushing rinsed with AmF/SnF_2 containing mouthrinse for 30 s. After 4 weeks the probands were re-examined.

RESULTS: Statistically significant decrease in dental plaque (PI) and gingival (GI) index values were found at the end of the study. The reduction of PI and GI values was significant in all groups but it was higher in the combined (toothpaste + mouthrinsing) group, than using toothpaste only.

CONCLUSION: The regular combined use of AmF/SnF_2 toothpaste and mouthrinse was more effective in the reduction of plaque accumulation and maintenance of gingival health than the toothpaste alone.

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Keywords: amine fluoride/stannous fluoride; plaque; gingivitis

Introduction

Amine fluorides as caries inhibitory and antiplaque agents have been developed about 40 years ago (Mühlemann *et al*, 1957), and their beneficial effect has been proved in over 600 studies from the beginning of the early 70s (Marthaler *et al*, 1970; Schmid, 1981, 1983).

The combination of amine fluoride (AmF) with stannous fluoride (SnF_2), as a new system in the prevention of gingivitis, has been introduced in about 1980. This combination showed a much better inhibition of plaque accumulation than these products alone and a favourable effect on oral hygiene and gingivitis was reported in several clinical studies by Mühlemann and Saxer's group (Mühlemann *et al*, 1981).

Combined use of the AmF/SnF_2 mouthrinse and AmF or usual toothpaste (Renggli, 1983; Künzel *et al*, 1990) in short-term clinical studies brought significant reductions in plaque and gingival indices. The first summarized results of clinical trials investigating the plaque and gingivitis inhibiting effect of AmF/SnF_2 combination were published in 1991 (Flores-de Jacoby, 1991).

Later on also a toothpaste containing AmF/SnF_2 became available, however, relatively few studies have been reported on clinical results with AmF/SnF_2 toothpaste, and on the combined use of toothpaste and mouthrinse. The first study lasting for 12 weeks, performed on schoolchildren with a mean age of 12.4 years, showed that the use of amine fluoride/stannous fluoride toothpaste resulted in a significant reduction of plaque accumulation and gingival inflammation, but a combination of toothpaste and mouthrinse proved to be more effective than the use of single compounds alone (Bánóczy *et al*, 1989). Further on, a 5 months, double blind study, aiming to assess the effects of both AmF/SnF_2 containing toothpaste and mouthwashes compared with a sodium fluoride (NaF) system, found a significantly higher reduction of dental plaque and Sulcus Bleeding Index in the AmF/SnF_2 group (Bánóczy and Nemes, 1991). Zimmermann *et al* (1993) investigated the effect of long-term (7 months) use of AmF/SnF_2 rinse compared with a placebo (non-fluoridated) mouthrinse on gingivitis and plaque

Correspondence: Dr Melinda Madléna, Department of Prosthetic Dentistry, Semmelweis University, Mikszáth K. tér 5, H-1088 Budapest, Hungary. Tel.: 00 361 338 4171, Fax: 00 361 317 5270, E-mail: madlena@fok.usn.hu
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accumulation and composition in probands continuing their usual oral hygiene. They found a reduction in the level of pathogenic bacteria of the oral cavity, a marked reduction in plaque accumulation and gingivitis, without any adverse effect in the course of long-term use. Another combined study of 9-months duration on gingivitis patients (Mengel *et al*, 1995). showed a long-term beneficial effect on gingival health supporting the physiological flora.

As several arguments have been raised recently for omitting alcohol from commercial mouthrinse solutions, studies (Arweiler *et al*, 2001) with different alcohol-free mouthrinses were initiated. The greatest reduction in plaque index and of plaque vitality *vs* placebo was found in the AmF/SnF_2 combination group, thus the alcohol-free mouthrinse solution seemed to be also effective in reducing plaque regrowth and plaque vitality. Damen *et al* (2002) showed that AmF/SnF_2 mouthrinses with or without alcohol are equally effective in reducing the acidogenic potential of dental plaque.

The aim of the present study was to investigate the influence of amine fluoride/stannous fluoride containing toothpaste and mouthrinse on plaque accumulation and gingival health of young adults after 4 weeks use, in a short term study.

Material and methods

At the preliminary examination 50 probands aged: 28.3 ± 7.2 years (mean ± S.D.) participated, having: no evidence of systemic illnesses and no antibiotic or immunosuppressive therapy, taking no drugs influencing the oral flora and gingival health, being without clinical signs of periodontitis (PPD ≤ 4 mm), having at least 20 natural teeth. The probands exercised no oral hygiene for 2 days prior to baseline examination in order to assess their cooperation and plaque accumulating capacity. On the days of baseline and final examinations they had no breakfast and exercised no oral hygiene.

The clinical examinations were carried out in a dental chair, using a dental mirror, dental and periodontal probe. Plaque accumulation was assessed by a full mouth score of Plaque Index (PI; Silness and Löe, 1964): gingival status was scored for the whole mouth according to the criteria of the Gingival Index (GI; Löe and Silness, 1963).

After the first examination seven persons were excluded because of very low PI and GI scores, one person because of tooth extraction on the previous day. Thus 42 persons remained in the study group, 18 men and 24 women: their mean age was 28.33 ± 7.19 (mean ± S.D.) years.

The 42 persons remaining in the study after a professional tooth cleaning, were divided into two groups: allocation to the groups was randomized and blinded. Neither the participants nor the examiner knew the numerical code. Between groups there were no significant differences in age, PI and GI scores. The participants were asked to use AmF/SnF_2 containing toothpaste and mouthrinsings as follows:

AmF/SnF_2 toothpaste group: used AmF/SnF_2 containing toothpaste twice a day for toothbrushing (morning and evening) for 3 min, and Meridol® toothbrush (von Bethlenfalvy *et al*, 2002; Yankell *et al*, 2003).

AmF/SnF_2 toothpaste and mouthrinse group: used AmF/SnF_2 containing toothpaste for toothbrushing twice a day for 3 min with Meridol® toothbrush, and after toothbrushing rinsed with an AmF/SnF_2 containing mouthrinse for 30 s.

After 4 weeks the patients were re-examined, without previous oral hygiene and breakfast by the same examiner (J.B.), and results were recorded blindly.

Statistical evaluation

Statistical evaluation was carried out separately for each of the two groups, to determine differences between baseline and final examinations, and to assess possible differences in changes of PI and GI values between the two groups. The nonparametric test (Mann–Whitney) was used to find significant differences between the examined clinical parameters (GI and PI).

Results

Table 1 shows the changes in Silness–Löe PI values between baseline and final examinations. Significant decrease ($P < 0.001$) of plaque index values has been found during the 4-weeks test period.

Table 2 shows the changes in Löe–Silness GI values between baseline and final examinations and between groups. The decrease of gingival index values was

Table 1 Changes in Silness–Löe plaque index (PI)

Examination group	*Baseline*	*Final*	*P*-value
AmF/SnF_2 toothpaste group	1.03 ± 0.20 ($n = 20$)	0.60 ± 0.13 ($n = 20$)	< 0.001
AmF/SnF_2 toothpaste + mouthrinse group	1.10 ± 0.20 ($n = 22$)	0.52 ± 0.10 ($n = 22$)	< 0.001

Table 2 Changes in Löe–Silness gingival index (GI)

Examination group	*Baseline*	*Final*	*P*-value
AmF/SnF_2 toothpaste group	0.87 ± 0.22 ($n = 20$)	0.505 ± 0.22 ($n = 20$)	< 0.01
AmF/SnF_2 toothpaste + mouthrinse group	1.05 ± 0.27 ($n = 22$)	0.50 ± 0.17 ($n = 22$)	< 0.001

statistically significant ($P < 0.01$) in the toothpaste group, and statistically strongly significant ($P < 0.001$) in the combined (toothpaste + mouthrinse) group.

The reduction of PI values in the toothpaste group was 42%, compared with the baseline, while that of the combined group was even higher: 53%. The GI values showed approximately the same pattern: in the toothpaste group the reduction was 42%, while in the combined toothpaste + mouthrinsing group it mounted to 52%.

Discussion

The beneficial effect of amine fluorides on dental plaque reduction is known for a long time (Marthaler *et al*, 1970). The caries reducing and plaque inhibiting effect of stannous fluoride was also reported many years ago (Muhler, 1958). However the combination of amine fluoride/stannous fluoride (AmF/SnF_2) showed a much better inhibition of plaque accumulation than these products alone and, as a result, a preventive effect on the development of gingivitis has been reported (Mühlemann *et al*, 1981; Flores-de Jacoby, 1991).

Usually, when toothbrushing is followed by rinsing with tap water, fluoride may be removed from the oral cavity. However additional use of a fluoride mouthrinse after a fluoride dentifrice increases the beneficial effect (Renggli, 1983; Künzel *et al*, 1990; Bánóczy and Nemes, 1991; Zimmermann *et al*, 1993; Mengel *et al*, 1995; van Strijp *et al*, 1999).

It has been shown that the additional use of AmF/SnF_2 containing mouthrinse to the use of the same toothpaste brought good results in young adults in a long-term (9 months) (Mengel *et al*, 1995) and in children in medium-term (12 weeks) (Bánóczy *et al*, 1989) clinical studies.

It was of interest however, if the same combination could also be effective in a short-term study in young adult population. In the present study a short-term (4 weeks) use of AmF/SnF_2 toothpaste only, and the combined use of AmF/SnF_2 toothpaste + mouthrinse in adults resulted in statistically significant decrease both in dental plaque and gingival index values. However the improvement was significantly greater in the combined group than using of toothpaste alone ($P < 0.05$).

Our observations in young adult population confirm results reported in previously published studies using AmF/SnF_2 containing products in different combinations with other products (Renggli, 1983; Künzel *et al*, 1990; Zimmermann *et al*, 1993). Those authors pointed out that use of AmF/SnF_2 containing toothpaste, and *some kind of* rinse results in a reduction in plaque accumulation. However, the combined use of AmF/SnF_2 containing toothpaste with the *same* rinse may result in a marked potentiation of the plaque reducing effect.

The present results showed that calculated percentage reductions both, in PI and GI values were higher in the combined toothpaste + mouthrinsing group, than in the toothpaste only group. These results point to the already observed fact that combined use of AmF/SnF_2 toothpaste and mouthrinse (Bánóczy *et al*, 1989) proves to be more effective, than the use of a single compound alone.

The beneficial effect of combined use of AmF/SnF toothpaste and mouthrinse also shows in the work of Mengel *et al* (1995) clearly. In this long-term comparative clinical study – using NaF and AmF/SnF_2 in different combinations in young adults' groups with gingivitis (aged between 15 and 41 years) a highly significant reduction was recorded in all groups, but the best results were found with the combined use of AmF/SnF_2 toothpaste and mouthrinse. Significant reduction in PI values had appeared already after 1 month and this finding is similar to those of the present study.

Conclusions

1 The use of an AmF/SnF_2 toothpaste, as well as the combined use of AmF/SnF_2 toothpaste and mouthrinse resulted in a clinically and statistically significant decrease in dental plaque (PI) and gingival index (GI) values of young adults in a short term period.
2 The reduction of PI and GI values was significantly greater in the combined AmF/SnF_2 group, than in the group using toothpaste only.

Use of amine fluoride/stannous fluoride results in a marked decrease in plaque and gingival inflammation. The combination of toothpaste with the same rinse is more effective than the toothpaste alone.

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