How many times is the optimum dental floss frequency in people with normal periodontium? A randomized controlled single blind clinical trial

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Original Article

Abstract

BACKGROUND AND AIM: Due to the inadequate of a toothbrush in cleaning of interdental areas and further advanced developing of the disease in this area, dental flossing seems essential. However, the developing of people's using dental floss as a habit is difficult. The purpose of this paper is to determine the use of dental floss frequency in reducing plaque and the optimal dental floss daily use frequency in people with a healthy periodontium.

METHODS: In this study, 44 dental students of School of Dentistry, Kerman, Iran, with healthy periodontal or at most a few bleeding on probing (BOP) areas were investigated. Scaling and root planning was performed for all subjects at baseline as well as necessary trainings about how to use the toothbrush and dental floss were instructed. In terms of using dental floss frequency, participants were divided into four groups of 22 each G1, G2, G3, and G4 which were meant to be used dental floss in every second day, a day, 2 or 3 times a day, respectively. At baseline, total plaque index (TPI), internal plaque index, and internal bleeding index were evaluated after 3 and 6 weeks. The collected data were analyzed by SPSS, statistical tests ANOVA, and paired t-test.

RESULTS: In this study, there was a significant reduction in plaque index after 6 weeks (P < 0.050) however there was no significant difference between groups in terms of the interdental bleeding index (IBI).

CONCLUSION: According to the results of this study, if a person with normal periodontal tissues uses the toothbrush and dental floss properly, using dental floss in every other day is sufficient to maintain the gingival healthy.

KEYWORDS: Plaque Index, Bleeding Index, Gingivitis, Dental Floss

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Today it is specified that the plaque, gingivitis, and more depth probing are found in the areas between the teeth. Furthermore, the progress of periodontal disease is more quickly in the area between the teeth,[1,2] and the toothbrush is not effective in removing the plaque between teeth surfaces that is why the dental floss as an adjunct tool for cleaning between dental plaque levels is recommended seriously, and it is effective in reducing gingivitis, bleeding on probing (BOP), and reduction of pocket depth in areas between teeth.[3,4]

Although in numerous articles, effects of plaque control devices in interdental areas are determined, and the kinds of floss in terms of quality,[5] the way that dental floss is used and the use of devices to maintain the dental floss are compared,[6] and also dental floss is compared to other interdental plaque control devices such as interdental brushes,[7] toothpick, and electrical interdental cleaning devices. However, in references, in order to control the disease, there is not any information about the frequency use of these interdental devices optimum. It is observed that only 8% of adults use dental floss in the UK.[8]

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In the study of Chen and Rubinson,[9] in the United States, it was observed that 20% of housewives, 11% of men, and 6% of children use dental floss. American Dental Association (ADA) reports by using dental floss, the plaque between the teeth may be removed up to 80%.[10] Oral hygiene practices is poor among the university students. So, to improving oral hygiene practices education and promotion is required.[11]

The most important problem in the use of interdental devices is the ability of patients and their motivation. Using dental floss is difficult for patients, particularly in the areas in which the interdental contact is tight. Brushing is accepted as a part of everyday life and health habits but just using the toothbrush to prevent the gum disease and periodontal disease is not enough. The internal plaque formation begins where the toothbrush cannot access it. In other words, people leave the most plaque in interdental surfaces. Using the toothbrush once in every 24-48 hours is sufficient to maintain periodontal health. Since, the most of the people have skills less than ideal, it has been shown that by using the toothbrush twice daily periodontal health is better provided, but using the toothbrush 3 times or more in a day will not improve dental health than twice in a day.[12] Due to the lack of the data regarding the daily optimum frequency use of dental floss and difficulty of using dental floss as a habit, it seemed necessary to do this research to determine the lowest possible frequency use of dental floss to create the most impact on periodontal health.

Methods

In this study, randomized controlled single blind clinical trial, 44 subjects were recruited on a voluntary basis with a requirement of at least 20 teeth. The participants who had used of systematic antibiotics, mouthwash, anticoagulants, those who had gingival hyperplasia (by reason other than drugs), smokers, those who received orthodontics treatment, periodontal surgery, and who had performed scaling in the last 3 months were not included. In intra-oral examination fixed prosthesis areas, or class 2, class 3 repairs were not considered in calculating the index.

Before starting the study, above mass and plaque, under gingival of patients was removed, and then Bass brushing technique and the way of using dental floss were instructed to the patients. In split mouth approach, each left and the right semi teeth were considered sample unit. 50% of the study populations used dental floss in the half of their mouths every second day and on the other half used once daily. Another 50% used dental floss in the half of their mouths, twice a day and another half their mouth 3 times a day of dental floss. Every sample unit was assigned randomly to a group using software.

Plaque index O'leary was measured by using plaque disclosing tablets. Zero (0) score indicates the absence of plaque and one (1) indicates that there was a layer of plaque in the vicinity of the marginal of gingiva. Total plaque index (TPI) was calculated by dividing the number of plaque levels on a total number of levels and by multiplying the result to gain a percentage of plaque levels.

Interdental plaque index (IPI): After calculating the overall plaque index, in the form simply by considering the area of distobuccal levels and mesiobuccal (MB) containing plaque, IPI: Index plaque between teeth which we have named IPI, was calculated by dividing the total number mesial or distal surface of a plaque on the total levels and multiplied its results by 100.

Interdental bleeding index (IBI) was measured by using a wooden toothpick between all teeth except the third morals. The wooden toothpick inserted in the space between the teeth horizontally and by pressing the papilla between teeth was moved 2 mm toward apical. The side of toothpick was toward occlusal. The presence or absence of hemorrhage at any site was recorded within 15 seconds with the numbers zero or one (0 or 1), respectively. IBI ratio of

area of hemorrhage was measured on a number of areas.[13]

The participants were asked to use dental floss n times before tooth brushing in a day according to their groups. The participants brushed based on the bass technique two times in a day in all 6 weeks. The IBI and IPI of patients were determined at baseline and at the end of the 3rd and 6th weeks. Toothpaste, toothbrushes, and dental floss were same for everyone. The participants should use dental floss once in a day or every other day, when the dental floss should be used two times in a day before teeth brushing in the morning and at night, and when the dental floss should be used the three times in a day, before teeth brushing in the morning and at night, and the dental floss was used without teeth brushing in the afternoon. The sample size of 22 patients was calculated in groups each. 44 people (including 88 half jaws) were assigned randomly according to the following intervention groups. We used data from similar articles[14] and statistical formula to estimate the sample size with repeated measures assumptions. Alpha level 0.050, power 0.900, SD1 0.22, and SD2 0.31 were used to estimate the sample size. Comparison of four intervention groups was analyzed by using repeated measurement ANOVA. Significant of $P < 0.050$ was considered.

Ethical clearance was permitted by Ethics Committee of Kerman University of Medical Sciences (ethical code: k/88/236), Iran. There is no ethical problem even if you do not use dental floss for two weeks, gingivitis is reversible and it was described to the participants in this study. In the present study, the lack of using floss was very short time. Authentic studies have been carried out with this method in references.[15]

Results

In this study, 44 dental students were studied with healthy periodontal or maximum with BOP in eight sites. Finally, there is no significant difference between groups which they were evaluated in terms of the index after three and 6 weeks ($P > 0.050$).

Table 1 shows the comparison between four groups which are listed in the index. As it can be seen in the first column of the right side of the table, the rate of P between groups is greater than 0.050 in comparison to all variables. Changes in these variables were not significant among the four groups.

Table 2 shows the comparison between baselines TPI, IPI, and IBI and same variables after 6 weeks in each group. The collected data were analyzed by SPSS (version 17; SPSS Inc., Chicago, IL, USA), statistical tests ANOVA, and paired t-test.

Table 1. Comparison of total plaque index, interdental plaque index, and interdental bleeding index among the four groups

Comparison of TPI, IPI, and IBI	Mean square	P
Comparison of baseline TPI among the four groups	94.632	0.592
TPI compared among the four groups after 3 weeks	36.389	0.736
TPI compared among the four groups after 6 weeks	45.218	0.568
Comparison of baseline IPI among the four groups	119.554	0.777
IPI compared among the four groups after 3 weeks	28.107	0.928
IPI compared among the four groups after 6 weeks	92.911	0.494
Comparison of baseline IBI among the four groups	1.935	0.684
IBI compared among the four groups after 3 weeks	0.637	0.401
IBI compared among the four groups after 6 weeks	1.206	0.246

Level of significance was $P < 0.050$.
TPI: Total plaque index; IPI: Interdental plaque index; IBI: Interdental bleeding index

Table 2. Comparison of baseline total plaque index, interdental plaque index, and interdental bleeding index and same variables after 6 weeks in each group

Group	Variable (baseline compare to 6 weeks)	Mean differences	P
G1	TPI	9.186	< 0.001[*]
G1	IPI	8.214	0.026[*]
G1	IBI	0.501	0.369
G2	TPI	11.985	< 0.001[*]
G2	IPI	12.537	0.010[*]
G2	IBI	0.663	0.096
G3	TPI	5.832	0.042[*]
G3	IPI	7.805	0.021[*]
G3	IBI	0.630	0.167
G4	TPI	9.209	0.012[*]
G4	IPI	13.962	< 0.001[*]
G4	IBI	0.407	0.132

[*]$P < 0.050$

TPI: Total plaque index; IPI: Interdental plaque index; IBI: Interdental bleeding index

Discussion

In the present study, the rate of TPI was reduced in all groups after three and 6 weeks. These results are conducted by Yost et al.,[14] Rosing et al.,[12] and Zimmer et al.[16]

The compliance of participants has been represented in the study. Of course, at beginning of the study, subjects were selected from the dental students that also provided easier education and compliance and then ordinary patients who were admitted to the school of dentistry. Furthermore, dental students have less dental anxiety compares to public, so lower calculus index and better oral health condition were presented.[17]

It also began the study with 44 participants. Every 44 participants were attended until the end of the study. This work also represents the aspirations of the participants and the training which has been given. According to the results of the study, the use of dental floss was daily for 1, 2, or 3 times a day or every other day in people with healthy periodontium, twice a day brushing is improved TPI, IPI and stability of IBI, and it maintains periodontal health in 6 weeks. So, in those with healthy periodontium and good habits of brushing and using dental floss is satisfactory every other day (seems necessary). It is not easy to develop a habit of using dental floss, in which it can be recommended to use it every other day.

There is unreliable evidence that flossing plus brushing may be associated with a small amount of plaque reduction at 1 and 3 months. No studies showed the effectiveness of flossing plus brushing for preventing dental caries.[18]

Scaling and root planning was conducted before starting the research project. And educated health instructions to all patients who had an almost completely intact from the beginning of the study were offered to them. Maybe that's why there was not observed significant differences between groups for IBI. If the scaling and root planning was not done before the study, it could be observed IBI differences between groups and therefore, we could have seen the effects of frequency of using dental floss on IBI. As regards, IBI was not increased after 6 weeks in groups, and it was remained very low at baseline and all four methods show the effectiveness of the use of dental floss. Generalizability of these results is slightly because healthy people were enrolled. Scaling and root planning was done before the study. The participants were dental students and brushing was also quite the standard. Moreover, all regions studied had lacked overhang or marginal subgingival

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restorations. Maybe in areas that factors caused increased plaque accumulation, using more of dental floss can be improved. In addition, participants have healthy periodontium or maximum areas of BOP. So, maybe those with more extensive disease or periodontitis disease or people with increased pocket depth. The use of dental floss in controlling the condition has more effects. These study also had some limitations which can be mentioned the following: Unilateral chewing food, using dental floss before the study, such as despite the disruptions.

Conclusion

This study shows that individuals with healthy periodontium can brush and flossing properly, using dental floss every other day is enough to maintain healthy interdental areas.

Conflict of Interests

Authors have no conflict of interest.

Acknowledgments

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