



รายงานวิจัยฉบับสมบูรณ์

โครงการวิจัย

การเปรียบเทียบประสิทธิภาพด้านการทำความสะอาดคราบจุลินทรีย์บริเวณด้านประชิดฟัน
ระหว่างด้ามยึดไหมขัดฟันชนิด Y และ F

Comparative effect of floss holder between Y and F type on interdental
plaque removal

โดย

อาจารย์ ทพ. ดร. อเนก ขยสดมภ์

สนับสนุนโดย

สถาบันวิจัย มหาวิทยาลัยรังสิต

2560

สวจ. 80/2560

Abstract

Title: Comparative effect of floss holder between Y and F type on interdental plaque removal

Researchers: Anek Chayasadom and Vittawin Dechosilpa

Institution: Faculty of Dental Medicine, Rangsit University

Year of Publication:

Publisher:

Sources:

No. of pages:

Keywords: Floss holder, Conventional floss, Interdental plaque removal

Copyrights: Rangsit University

Plaque accumulation is one of the problems that can be found in people at all ages. To prevent plaque from building up, we use toothbrush and dental floss. Nowadays, there are two types of floss holder, F type and Y type, for interdental plaque removal. Gingivitis and periodontitis are preventable with proper flossing, which takes only two to three minutes a day. Therefore, investigators are interested in comparing the effect of floss holder between Y and F type on interdental plaque removal, also determining the effect of floss holder and conventional dental floss, both before and after using for interdental plaque removal. **Objective:** The purpose of this study is to compare the effect of floss holder between Y type, F type and conventional dental floss on interdental plaque removal. **Materials and methods:** The forty-three systemic healthy subjects aged 18-25 years old who have been studying in dental faculty of Rangsit University were recruited for this research. For the first visit, all subjects' plaque index were recorded and received oral prophylaxis (scaling). Then, we gave them conventional dental floss for one-month using. For the second visit, all subjects' plaque index were recorded both before and after using conventional dental floss by blind technique-using red sunglasses. Then they were divided into two groups by stratified random sampling. One group used floss holder type F and the other used floss holder type Y. We also gave them oral hygiene instruction for two-week using. For the third visit, both groups' plaque index were recorded both before

and after using floss holder by blind technique. Then, two groups of subjects alternated their previous type of floss holder to the other group. We also gave them floss holder for two-week using. Finally, the forth visit, both groups' plaque index were recorded, both before and after using floss holder by blind technique. **Results:** According to the study, the efficiency between conventional dental floss, F type and Y type floss holder in all proximal surfaces of teeth are 37.25% Y type floss holder, 32.79% F type floss holder and 31.70% conventional dental floss. The efficiency between conventional dental floss, F type and Y type floss holder in all proximal surfaces of anterior teeth are 18.98% Y type floss holder, 14.55% F type floss holder and 14.26% conventional dental floss. The efficiency between conventional dental floss, F type and Y type floss holder in all proximal surfaces of premolar teeth are 9.97% Y type floss holder, 9.39% F type floss holder and 8.90% conventional dental floss. Lastly, the efficiency between conventional dental floss, F type and Y type floss holder in all proximal surfaces of molar teeth are 8.86% Y type floss holder, 7.81% F type floss holder and 8.50% conventional dental floss. **Conclusion:** Dental floss has an effective method used for interproximal plaque removal. There are many types of dental floss in the market which are conventional dental floss, Y-type floss holder and F-type floss holder. The result of this study shows that the Y-type floss holder is the most effective dental floss in removing interproximal plaque. The value of plaque index in every area are different, however, there is no statistically significant difference.

Acknowledgement

The success and final outcome of this research required a lot of guidance and assistance from many people, supported by Rangsit University. We also appreciate our volunteers for taking their time to participate in our project.

Lastly, we would like to extend our gratitude to our internal research guide for giving us support and help us successfully complete our research.



Content

	Pages
Abstract	ก
Acknowledgement	ค
Content	ง
List of Illustrations	จ
Chapter 1 : Introduction	1
1.1 Background	1
1.2 Objective	2
1.3 Conceptual framework	2
Chapter 2 : Review literature	3
Chapter 3 : Methodology	6
3.1 Sample selection	6
3.2 Sample size calculation	6
3.3 Materials	6
3.4 Methods	7
3.5 Statistics used in this research	7
Chapter 4 : Results and discussion	10
4.1 Results	10
4.2 Discussion	13
Chapter 5 : Conclusion	16
References	17

List of Illustrations

	Pages
Figure 1 : Represents the percentage of efficiency between conventional dental floss, F type and Y type floss holder in all proximal surfaces of teeth	11
Figure 2 : Represents the percentage of efficiency between conventional dental floss, F type and Y type floss holder in all proximal surfaces of teeth	12
Figure 3 : Represents the percentage of efficiency between conventional dental floss, F type and Y type floss holder in all proximal surfaces of teeth	13



Chapter 1

Introduction

1.1 Background

Plaque accumulation is one of the problems that can be found in people at all ages. Plaque is the adhesive, colorless film of bacteria that forms on teeth. Plaque can be developed when eating food containing carbohydrates. Bacteria lives in the mouth thrive on these foods, producing acids as a result. Over a period of time, these acids destroy tooth enamel, resulting in tooth decay. Plaque can also develop on the tooth roots under the gum and cause breakdown of the bone supporting the tooth. Plaque that is not removed daily by brushing and flossing between teeth can eventually harden into tartar. Brushing and flossing become more difficult as tartar collects at the gum line. As the tartar, plaque and bacteria continue increasing, the gum tissue can become red, swollen and possibly bleed when you brush your teeth. This called gingivitis, an early stage of gum disease. (Osso and Kanani, 2013)

To prevent plaque from building up, brush your teeth at least twice a day with a soft, rounded-tip bristled toothbrush, use a fluoride-containing toothpaste. Also floss between teeth at least once a day to remove food particles and bacteria, whether by dental floss or floss holder. (American Dental Association ; online) Nowadays, there are 2 types of floss holder which are F-type and Y-type. The use of floss has been long established as an option for interdental plaque removal.

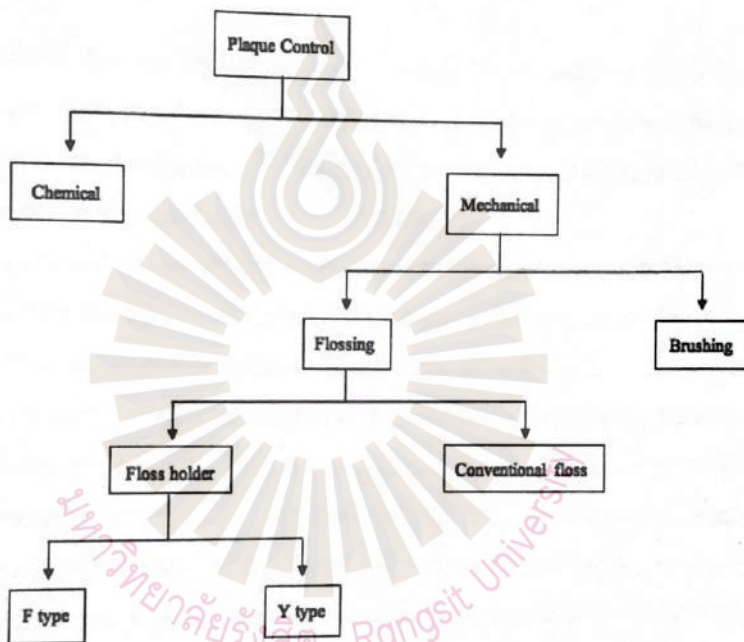
Gingivitis and periodontitis are preventable with proper flossing, which takes only two to three minutes a day (Vilardi, 2017 : online) Therefore, investigators are interested in comparing the effect of floss holder between Y and F type on interdental plaque removal and also to determine the effect of floss holder and dental floss before and after use on antiplaque.

1.2 Objective

2

To compare the efficacy of interdental plaque removal between conventional dental floss, floss holder type Y and F.

1.3 Conceptual framework



Chapter 2

Review literature

Pathogenesis of periodontal disease

Periodontal diseases are the most common human diseases. It's widespread in both developed and developing country, the majority of the population in Thailand is also affected. (Nazir, 2017)

The results of 7th National Oral Health Survey (2012) showed prevalence of periodontal disease 15.6% and gingivitis with bleeding on probing 39.3% in the group aged 35–44 years old, periodontal disease 32.1% and gingivitis with bleeding on probing 24.4% in the group aged 60–74 years old. (Massler et al., 1957)

Periodontal disease is a result of a complex factor between the dental biofilm and the host immune-inflammatory community that develop in the gingival and periodontal tissues in which challenged by the bacteria. Some cases of gingivitis can be progress to periodontitis even though it is widely accepted that gingivitis can turn to periodontitis. With gingivitis, the inflammatory lesion is located at the gingiva. However, with periodontitis, the inflammatory processes extend to additionally affect the periodontium which are periodontal ligament and the alveolar bone. Because these inflammatory changes is the breakdown of the fibers of the periodontal ligament, resulting in clinical loss of attachment together with resorption of the alveolar bone. (Benzie and Wachtel-Galor, 2011)

During the 1970s and 1980s, bacterial plaque was generally considered as a prominent cause of periodontitis. In addition, it was accepted that poor oral hygiene resulted in increasing plaque accumulation, which also turn into periodontal disease. (Preshaw, 2012)

Dental plaque and flossing

Dental plaque is composed of food fragments, microbes, glycoproteins, or proteins found in saliva. It is transparent in color and invisible to the naked eye. When plaque is not removed between the teeth, it will adhere to the teeth. Then it will form a hard-

mineralized bacterial matrix substance called calculus, or tartar. Untreated properly gingivitis can lead to periodontitis or inflammation of the gums. (Collins Dictionaries, 2014)

Due to its hard bacterial-complex matrix formation, dental calculus is not easily removed. It is especially difficult to reach the calculus with a toothbrush between the teeth and below the gum-line, or cervical margin. The bacteria can enter the crevasse of the gum and destroy the periodontium or supporting structures surrounding the teeth, such as bone and gingiva.

Flossing should be done at least once a day to make sure food debris and other microbes are removed from the teeth before the dental calculus hardens from dental plaque; it takes about 12 hours or so for the formation of the bacterial matrix to harden. Because the anatomy of the gums surrounding the teeth almost like a pocket or a crater filled with space, so food debris or plaque can easily lodge inside the gum, causing a place for bacteria to replicate and release acid, particularly lactic acid, causing inflammation and even bleeding gums due to the irritation of the bacteria. It's this bacterial acid that causes gum disease and cavities.

If, over time, more bacteria accumulate between the teeth, the bacteria enter the PDL space or periodontal ligaments around the gum—specialized connective tissue that keeps the tooth attached or anchored to the bone. The gingival crevicular fluid is then released, which is inflammatory exudate (or pus) that fights the infection with a team of white blood cells, causing more inflammation of the gums. Eventually, periodontitis occurs; the bacteria reaches the bone, causing irreversible destruction of the teeth.

According to American Dental Association, interdental cleaning, whether floss or any other device such as floss holders or floss picks, are vital to dental health and have been proven to help remove the plaque buildup that contributes to gum disease and cavities. Because the gingiva is made of connective tissue covered with mucous membrane that can easily be injured, proper flossing technique is important, especially where the adjacent teeth are very close together or when there are wide open spaces between teeth. (ADA Science Institute : online)

Hand-held dental floss (Floss holder)

Hand-held dental floss (floss holder) is a device that allows flossing into the oral cavity without using fingers. The hand-held flosses have many types such as a F-shaped or Y-shaped cross-section handle with or without the housing for the floss supply. F-shaped device have the floss positioned parallel to the handle axis. Y-shaped devices position the floss perpendicular to the handle axis. The problems that usually found during misuse of floss holder are unable to maintain tension of floss against tooth and fully wrap around tooth side. It needs to set a fulcrum or finger rest (eg. cheek, chin) to avoid trauma to the gums or floss cuts. Floss holder can be used a number of times, while conventional dental floss must be changed after each use.



Chapter 3

Methodology

3.1 Sample selection

The forty-three systemic healthy subjects aged 18-25 years old who have been studying in dental faculty of Rangsit University were recruited for research in the period between September 2017 and September 2018 based on the following. (Löe et al., 1978) Inclusion/exclusion criteria were as follow:

1. Having a minimum of 20 contacts of natural teeth
2. Subjects have been given the diagnosis as gingivitis associated with dental plaque only (AAP 1999)
3. No history of smoking or tobacco used in the last 6 months.
4. Subject who has systemic disease, which affect our study.
5. Subjects have any fixed or removable orthodontic appliances or prosthesis.
6. Subjects have been given diagnosis as periodontal disease or have periodontal treatment in the previous 6 months.
7. Subjects with any physical limitations that might compromise normal tooth brushing and flossing.
8. Not willing to comply with the study protocol

3.2 Sample size calculation

From the previous study the mean of plaque index, before and after using dental floss are 1.40 and 1.04 respectively and the standard deviation before and after used were 0.65 and 0.67 respectively. (Muniz et al., 2017). Our sample size per one group is 11.4 and the SD is 0.4359.

3.3 Materials

1. Exploration set (mouth mirror, cotton pliers, explorer (Hu-friedy,USA)
2. Periodontal set (Gracey curette, sickle curette, Naber probe, William probe)

3. "Dr. Phillip" Floss holder F and Y type
4. Conventional dental floss
5. Plaque finder solution (Erythrosine disclosing 6%)
6. Red sunglasses
7. Materials for OHI (Teeth model, toothbrush, conventional dental floss, floss holder type F and Y)
8. Ultrasonic scaler (P5 Newtron XS and scaler tip 1S) and hand scaler (Premier Dental,USA)
9. Rubber cup, pumice and prophy handpiece

3.4 Methods

Following the approval of the Ethical Committee of Rangsit university, we define subjects have to participate in our research for four visits.

The first visit

- Clinical periodontal parameter (Darby and Walsh, 1995) which plaque (modified from O'Leary, Drake and Naylor, 1972) is assessed for motivation patient.
- Oral prophylaxis (Scaling) is done for all 43 subjects.
- Oral hygiene instruction included Modified Bass brushing technique with round-end, soft bristle toothbrush and fluoride toothpaste and conventional dental floss are given.
- Giveaway conventional dental floss so the subject can use it for 1 month.

The second visit

One month after oral prophylaxis

Subjects who had abstained from oral hygiene procedures in the previous 24 hours and from eating and drinking in the previous four hours received a plaque assessment (modified from O'Leary et al., 1972). After that, we will give red sunglasses to the subjects so that they unaware of the plaque accumulation on their teeth. Then subjects have to use conventional dental floss as the instruction. Then record the plaque index again to find an efficacy of the conventional dental floss in reducing the interdental plaque. After that, randomly assigned the subjects into two groups; one group use floss holder type F

and the other use floss holder type Y and give oral hygiene instruction. Polishing with dental prophylaxis handpiece and pumice are provided to the subjects.

The third visit

Two weeks later

Subjects who had abstained from oral hygiene procedures in the previous 24 hours and from eating and drinking in the previous four hours received a plaque assessment (modified from O'Leary et al. 1972). After that, we will give red sunglasses to the subjects so that they are unaware of the plaque accumulation on their teeth. Then subjects have to use dental floss holder as they are assigned last 2 weeks. Then record the plaque index again to find an efficacy of the dental floss holder in reducing the interdental plaque. After that, two groups of subjects switch the type of dental floss holder with the other and give oral hygiene instruction. Polishing with dental prophylaxis handpiece and pumice are provided to the subjects.

The fourth visit

Two weeks later

Subjects who had abstained from oral hygiene procedures in the previous 24 hours and from eating and drinking in the previous four hours received a plaque assessment (modified from O'Leary et al., 1972). After that, we will give red sunglasses to the subjects so that they are unaware of the plaque accumulation on their teeth. Then subjects have to use dental floss holder as they are assigned last 2 weeks. Then record the plaque index again to find an efficacy of the dental floss holder in reducing the interdental plaque. Polishing with dental prophylaxis handpiece and pumice are provided to the subjects.

3.5 Statistics used in this research

The calibration between intra-examiner and extra-examiner will be provided before recording the indexes. Kappa statistic will be 0.81-1 in order to get the almost perfect agreement. To compare an effectiveness of two types of floss holders and standard dental floss by using plaque index (modified from O'Leary et al., 1972) as a dependent variable.

Shapiro-Wilk test will be used to determine the data if the data is a normal distribution, the repeated measurement ANOVA test will be used to analyze the differences among the groups in plaque index. On the other hands if the data is not a normal distribution, Friedman test will be used instead. p-value of less than 0.05 would be considered as a statistically significant, P-value of 0.05 or higher indicates statistically non-significant difference.



Chapter 4

Results and discussion

4.1 Results

Forty-three dental students participated in the study, but only thirty-seven dental students participated the whole study and were included in the analysis. Hence, the score of six dental students were excluded. Among participants, 78.38% (29/37) were female and 21.62% (8/37) were male. All results are categorized by the efficiency of interproximal cleansing of each type of dental floss (conventional, F type and Y type) in different areas of teeth; all teeth, anterior teeth, premolar and molar area. The difference of plaque score was from the before - after plaque score record of every visit.

From the study, the efficiency between conventional dental floss, F type and Y type floss holder in all proximal surfaces of teeth shows that Y type floss holder has the best efficiency in cleaning at the interproximal surfaces. In this study, we calculated first plaque index (before the subjects used interproximal cleanser) and the second plaque index (after the subjects used interproximal cleanser) and then calculated the difference between those two. The proximal areas that have been recorded will be calculated into percentage. Every value in the proximal areas of teeth which are anterior teeth, premolar and molar teeth will be divided with the total of proximal surfaces that have been recorded and multiply with one hundred. Therefore, every number that we used to compare the efficacy of each type of floss holder will be in percentage.

From difference of the plaque score record, Y type floss holder shows 37.25%. While F type floss holder and conventional dental floss shows 32.79%, 31.70% respectively.

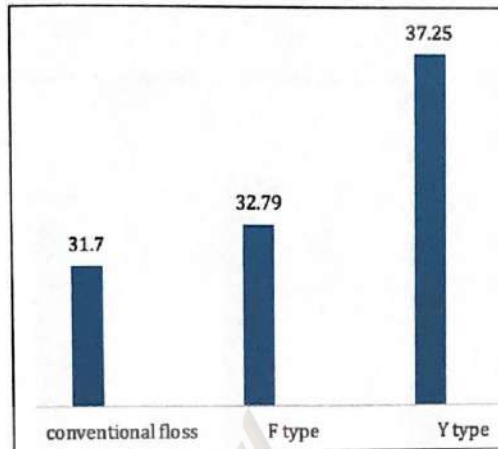


Figure 1: Represents the percentage of the efficiency between conventional dental floss, F type and Y type floss holder in all proximal surfaces of teeth from the difference of plaque index before using interproximal cleansing and after using interproximal cleansing.

The efficiency between conventional dental floss, F type and Y type floss holder in all proximal surfaces of anterior teeth shows that Y type floss holder has the best efficiency in cleaning at the interproximal surfaces. From difference of the plaque score record, Y type floss holder shows 18.98%. While F type floss holder and conventional dental floss shows 14.55%, 14.26% respectively.

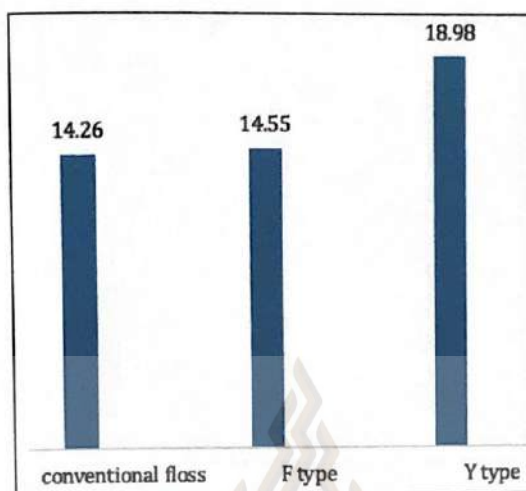


Figure 2: Represents the percentage of efficiency between conventional dental floss, F type and Y type floss holder in all proximal surfaces of anterior teeth from the difference of plaque index before using interproximal cleansing and after using interproximal cleansing.

The efficiency between conventional dental floss, F type and Y type floss holder in all proximal surfaces of premolar teeth shows that Y type floss holder has the best efficiency in cleaning at the interproximal surfaces. From difference of the plaque score record, Y type floss holder shows 9.97%. While F type floss holder and conventional dental floss shows 9.39%, 8.90% respectively.

Lastly, the efficiency between conventional dental floss, F type and Y type floss holder in all proximal surfaces of molar teeth shows that Y type floss holder has the best efficiency in cleaning at the interproximal surfaces. From difference of the plaque score record, F type floss holder shows 8.86%. While Y type floss holder and conventional dental floss shows 7.81%, 8.50% respectively.

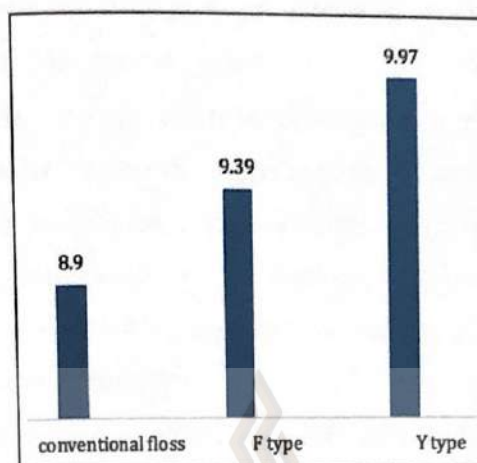


Figure 3: Represents the percentage of efficiency between conventional dental floss, F type and Y type floss holder in all proximal surfaces of premolar teeth from the difference of plaque index before using interproximal cleansing and after using interproximal cleansing.

From our questionnaires, nineteen subjects did not agree that floss holder has more efficiency in interproximal areas than dental floss and eighteen subjects agreed that floss holder has more efficiency than dental floss. As you can see, there was no different between these two opinions. However, there were thirty subjects thought that dental floss holder is easier to use than conventional dental floss. Only seven subjects thought differently.

4.2 Discussion

The removal of plaque is considered to be important for the maintenance of gingival health, prevention of periodontal disease and the reduction of caries. (Warren and Chater, 1996) Unfortunately, the toothbrush is relatively ineffective at removing interproximal plaque, and therefore patients need to resort to additional techniques. Over the years, it has been generally accepted that dental floss has a positive effect on removing plaque. Dental floss is the most widely used method of interproximal cleaning

and the American Dental Association reports that up to 80% of interproximal plaque may be removed by this method. As dental plaque is naturally pathogenic and dental floss disrupts and removes some interproximal plaque.

The main problem with all interproximal cleaning is patient's ability and motivation. Patients are known to find flossing difficult, especially where there are tight contact points. Nowadays, in the market there is dental floss holder which has been developed to make it easier to clean the interproximal area. Therefore, this study is interested in compared the interdental plaque removal capacity of conventional dental floss, Y type floss holder and F type holder.

The data from this study revealed that there is no statistically significant beneficial effect difference from interproximal dental flossing by trained. It shows that the Y type floss holder has the best efficiency in removing interproximal plaque in all type area surface of all tooth except at the interproximal surfaces of molar teeth which shows that F type floss holder has the best efficiency in that area.

From the questionnaire, it shows that the thirty-seven dental students in this study mostly brush their teeth with modified Bass' technique and use a conventional dental floss in daily life. And some are using other types of dental floss and using dental floss twice a day. It also shows the knowledge and opinion of using dental floss in this group of dental students. Some of them thought that conventional dental floss could remove interproximal plaque better than floss holder but some of them thought that dental floss holder is better in removing interproximal dental plaque (in equal number). All thirty-seven dental student shows acceptable basic knowledge of oral hygiene practice which are how to using dental floss and using toothbrush. Such as, even if they are using toothbrush correctly, it is not effective enough in removing plaque in oral cavity. Dental floss will give a positive effect in removing dental plaque in the area that toothbrush cannot which is interproximal plaque. The conventional dental floss, floss holder F type and Y type are also unequally effective in removing interproximal dental plaque.

Moreover, this questionnaire also shows the preference and the convenience of dental floss holder from the dental student opinions. The F type floss holder is the easiest method in removing interproximal plaque in all area but the Y type floss holder gives the best result in removing interproximal plaque. Since Y type floss holder is difficult to use,

it makes the difference of the interproximal plaque score record in molar area is less than the others.

As our study was studied among the dental student who already showed a significantly higher level of knowledge on oral health care issues, which may influence the skill of using dental floss. On the other hands, if this study was studied among the normal people, the result may be statistically significant difference from this study due to the knowledge of oral health care issues and skill of using all of the type of dental floss.



Chapter 5

Conclusion

Dental floss is a method that effectively use for removing interproximal plaque which can prevent the future interproximal dental caries. There are many types of dental floss in the market which is conventional dental floss, Y type floss holder and F type floss holder. The result of this study shows that the Y type floss holder is the most effective dental floss in removing interproximal plaque. However, the value of plaque index in all areas are different but there is no statistically significant difference.



- Ossó D. and Kanani N. Antiseptic mouth rinses: an update on comparative effectiveness, risks and recommendations. *J Dent Hyg* 2013; 87(1): 10-18.
- American Dental Association [homepage on the Internet]. Atlanta: Plaque and Your Teeth; c2017 [updated 2017 January 25]. ADA of WebMD, LLC; [about 2 screens]. Available from: <https://www.webmd.com/oral-health/guide/plaque-and-your-teeth>
- Vilardi MA. A healthy connection between gums and teeth can help you keep your natural smile for life: Understanding Periodontal Pockets. Dr. Mario A. Vilardi [serial on the Internet]. 2017 Jan [cited 2017 Jan 5]; [about 3 p.]. Available from: <https://www.deardocor.com/articles/understanding-periodontal-pockets/>
- Nazir MA. Prevalence of periodontal disease, its association with systemic diseases and prevention. *International Journal of health sciences* 2017 Apr-Jun;11(2):72-80.
- Massler M, Rosenberg HM, Carter W and Schour I. Gingivitis in young adult males: Lack of effectiveness of a permissive program of toothbrushing. *J Periodontol* 1957; 28(2):111-124.
- Iris F. F. Benzie and Sissi Wachtel-Galor. Biomolecular and Clinical Aspects. In: *Herbal Medicine* (editor(2)). Herbal Medicine. 2. In (FL): CRC Press/Taylor & Francis; 2011. ISBN-13:978-1-4398-0713-2
- Preshaw PM. *Etiology of periodontal disease*. 1st ed. London: S. Paul; 2012. (76-77.)
- Collins Dictionaries. *Collins English Dictionary-Complete and unabridged*. 12th ed. London: HarperCollins publishers; 2014. 2336.
- Center for Scientific Information, ADA Science Institute [homepage on the Internet]. Center for Scientific Information, ADA Science Institute. American: [Last Updated: October 20, 2017]. American Dental Association (ADA); [about 2 screens]. Available from: <https://www.ada.org/en/member-center/oral-health-topics/floss>
- Löe H, Anerud A, Boysen H and Smith M. The natural history of periodontal disease in man: the rate of periodontal destruction before 40 years of age. *J Periodontol* 1978, 49(12), 607-620.

- Muniz FWMG, Sena KS, Oliveira CC, Verissimo DM, Carvalho RS and Martins RS. Efficacy of dental floss impregnated with chlorhexidine on reduction of supragingival biofilm: a randomized controlled trial. *Int J Dent Hyg* 2015, 13(2), 117-124.
- O'Leary TJ, Drake RB and Naylor JE. The Plaque Control Record. *J Periodontol* 1972, 43(1): 38-38.
- Darby ML and Walsh MM. Periodontal and oral hygiene assessment. *Dental Hygiene Theory and Practice*. Philadelphia: WB Saunders;1995.546.
- Warren PR and Chater BV. An overview of established interdental cleaning methods. *J Clin Dent*. 1996;7(3 Spec No):65-9.

