

Research Report

The effectivity of toothpick tooth brushing method on plaque control

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ABSTRACT

Background: Periodontal diseases are associated with bacteria species which present in biofilms that colonize on dental surfaces. Several tooth brushing methods had been known and proved to be effective in maintaining oral hygiene. Among them, tooth pick technique was a relatively new method and its superiority in removing interproximal plaque was better than other methods. **Purpose:** The purpose of this study was to examine the effectivity of toothpick tooth brushing method to conventional method on periodontal health. **Methods:** This research was designed as an analytical observational study. Thirty samples selected from five hundred and twelve males Indonesian Air-force members in Malang, aged 18–40 yrs, with periodontal pockets (≤ 5 mm) in upper or lower teeth, without crowding, gingival index minimal > 1 (moderate gingivitis), OHI-S score minimal ≥ 1.3 (moderate), without systemic diseases, do not undergone medical therapy/drug prescriptions, without using mouth rinse during study, and without prosthesis. There were thirty samples in this research and divided to two groups, fifteen samples each. The groups were toothpick tooth brushing method and conventional method (control group). In this study oral hygiene index simplified (OHI-S), gingival index (GI), bleeding on probing (BOP) and pocket depth were examined. **Results:** There were significant differences ($p = .001$) in OHI-S, GI, BOP, and PD before and after conducting each toothbrushing method, as well as differences between means (quarrel means), that were $p = .003$; $p = .001$; $p = .001$ and $p = .001$ consecutively. **Conclusion:** Toothpick brushing method was more effective in plaque control compared to conventional method.

Key words: Effectiveness, toothpick tooth brushing method, periodontal health

ABSTRAK

Latar belakang: Penyakit periodontal berhubungan dengan bakteri yang berkoloni dalam biofilm yang terdapat di permukaan gigi. Saat ini telah dikenal berbagai macam metode menyikat gigi tetapi masih belum ada penelitian tentang efek metode tersebut terhadap OHI-S. Penelitian ini ingin menunjukkan efek menyikat gigi dengan metode toothpick terhadap kesehatan jaringan periodontal. **Tujuan:** Tujuan dan penelitian ini adalah untuk mengetahui efektivitas metode toothpick dibandingkan metode konvensional dalam kontrol plak. **Metode:** Jenis penelitian ini adalah analitik observasional. Sampel sejumlah tiga puluh orang diseleksi dari 512 anggota TNI Angkatan Udara Skadron Pasukan Khas 464 Wing II Lanud Abdulrahman Saleh Malang, usia 18–40 tahun, dengan kedalaman poket periodontal (≤ 5 mm) pada gigi rahang atas/bawah dengan, susunan gigi yang tidak berdesakan, memiliki skor gingival indeks minimal > 1 (gingivitis sedang), memiliki skor OHI-S minimal $\geq 1,3$ (sedang), tanpa ada kelainan sistemik, tidak dalam perawatan dokter/mengonsumsi obat-obatan, tidak menggunakan obat kumur selama penelitian, tidak menggunakan protesa. Sampel dibagi menjadi dua kelompok, lima belas orang menggunakan metode toothpick sedangkan lima belas orang menggunakan metode konvensional sebagai kelompok kontrol. **Hasil:** Terdapat perbedaan yang bermakna ($p = .001$) pada OHI-S, GI, BOP dan kedalaman poket sebelum dan sesudah menyikat gigi dengan masing-masing metode menyikat gigi yang ditetapkan. Selain itu, terdapat perbedaan bermakna

antara selisih rerata sebelum dan sesudah menyikat gigi ($p = .003$; $p = .001$; $p = .001$ and $p = .001$) antara kedua kelompok tersebut.

Kesimpulan: Metode toothpick brushing lebih efektif untuk kontrol plak dibanding dengan kelompok kontrol.

Kata kunci: Efektifitas, metode menyikat gigi toothpick, kesehatan periodontal

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INTRODUCTION

Since the beginning of modern dentistry, emphasis has been placed on the importance of oral hygiene. Toothbrushing is the most common form of oral hygiene habit practiced by people in developed countries. Indeed, mechanical oral hygiene procedures are thought to be essential for proper plaque control and maintenance of periodontal health. In fact, the single most continuous, cornerstone of preventive and public health dentistry has always been the cleaning of teeth. The presence of food remnants, dental plaque and calculus in the oral cavity showed the degree of oral hygiene. Effective oral hygiene performed regularly by the patient disrupts the plaque biofilm on the tooth surface and is considered an important factor in helping to reduce the incidence of periodontal disease. Poor oral hygiene has been shown to increase the occurrence and progression of periodontal disease. The simultaneous presence of plaque and poor oral hygiene practices can cause the initiation of periodontal inflammation/gingivitis. These factors alone were able to elicit gingival inflammation which will progress to periodontal diseases. Relationship between oral hygiene and periodontal disease severity was existed, therefore, optimal oral hygiene is needed to prevent and cure periodontal disease as well as maintaining tissue health.^{1,2}

Inflammation is now known to play a critical role in diseases that are not usually classified as inflammatory diseases, such as cardiovascular and Alzheimer's diseases. Periodontal diseases are associated with bacteria species which present in biofilms that colonize on dental surfaces. Several tooth brushing methods had been renowned and proved to be effective in maintaining oral hygiene.^{3,4} Among them, tooth pick technique was a relatively new method and its superiority in removing interproximal plaque is better than other methods. Interproximal area cleaning is important since it is the location where periodontal pathogenesis initializes. It also stimulates the secretion of immunoglobulin A which functions as mucosal defense mechanism. Tooth pick tooth brushing method was done by placing the tip of toothbrush bristles on the gingival edge facing tooth crown and forms 30° angle with tooth long axis. These bristles are pushed into the interdental space and pulled out with, the same action of tooth pick movement; applied in the buccal and lingual side. This forward and backward movement was repeated 8-9 times every region.^{5,6} This removal method of interdental plaque could be done without dental floss or interdental brush. A

small amount of tooth brush bristles were able to enter the narrow interdental space, and one or two tufts could enter the wide interdental space.⁷

Since this method was less known by Indonesian people, therefore we were obliged to conduct a research regarding the use and ability of toothpick toothbrushing method in reducing pocket depth, gingival index and increasing oral hygiene index.

MATERIALS AND METHODS

The population was members of Indonesian Air Force Special Squadron Troop 464 Wing II Abdurachman Saleh Airport. Sample criteria were as follows: male 18–40 years; periodontal pocket (< 5 mm) in upper and lower jaw; uncrowded teeth; gingival score index minimal >1 (moderate gingivitis); OHI-S score minimal >1.3 (moderate); without the presence of systemic disease; did not undergone medical therapy; did not use oral rinse during research; and did not use prosthesis. Examination was done to all population in 10 days, and there were 30 members selected. The selected subjects were divided into 2 groups, toothpick toothbrushing methods and conventional methods (control group), 15 samples each.

In toothpick method group, they were instructed how to conduct toothpick method one week before, and were evaluated in the third day in the same week. One week after pre-experimental period, in the toothpick method group pocket depth, gingival index, BOP and OHI-S were measured and the location was recorded. In OHI-S examination, scoring was recorded in a form. Afterward, subjects were reeducated about toothpick toothbrushing method until they understand and were able to demonstrate this technique. Operator also show directly in each subject how to toothbrush with this method. Subsequently subjects were instructed to brush their teeth using toothpick method at home for 2 weeks with the same toothbrush and toothpaste brands and toothbrush frequency was twice daily (in the morning and at night); tooth paste length was ± 1 cm and leaflet about toothpick toothbrushing method instruction. Evaluations were done in day 3, 6, 9 and 12 in order to was given see the ability of subjects to apply this method. Two weeks later pocket depth (in the same side of the tooth), gingival index (GI), BOP and OHI-S were measured. In day 12, measurement of pocket depth was conducted towards teeth in the same side, gingival index, BOP and OHI-S. In order to achieve good examination reliability and

validity, examination was done by a periodontist and each group were divided into 3 subgroups which consisted of 5 samples. This group division method was done for treatment groups as well as control group, and examination of each subgroups was done separately by one day.

In control group as done another day, measurements were done directly, then subjects were undergone scaling and root planing. They were also instructed to brush their teeth twice/day using the same toothbrush and toothpaste (tooth paste length ± 1 cm) with the toothpick group. After 2 weeks, subjects were scheduled for evaluation. Both groups evaluations were recorded. Statistical data analysis was done with Wilcoxon Signed Rank test; Paired t-test and McNemar test.

RESULTS

Table 1. Means and difference significancy of OHI-S, GI, BOP and pocket depth (PD) before and after tooth pick method (treatment group)

Toothpick	Mean \pm SD		Significancy
	before	after	
OHI-S	3.14 \pm .44	1.17 \pm .52	p = .001
GI	2.13 \pm .44	.88 \pm .25	p = .001
PD (mm)	4.50 \pm 2.88	2.76 \pm .58	p = .001
BOP	.91 \pm .29	.11 \pm .31	p = .001

Table 2. Means and difference significancy of OHI-S, GI, BOP and pocket depth (PD) before and after common method (control group)

Control	Mean \pm SD		Significancy
	before	after	
OHI-S	3.15 \pm .47	2.10 \pm .75	p = .001
GI	2.40 \pm .26	1.55 \pm .40	p = .001
PD(mm)	4.38 \pm .23	3.93 \pm .33	p = .001
BOP	.95 \pm .23	.73 \pm .44	p = .001

Table 3. Difference between means and significancy of pre and post treatment in treatment and control groups

	Quarrel mean before and after from 2 weeks		Significancy (2-tailed)
	Toothpick	Control	
OHI-S	1.97	1.05	.03
GI	1.25	.85	.01
PD (mm)	1.74	.45	.01
BOP	.80	0,22	.01

The result of this study revealed that Greene-Vermillion OHI-S status and GI in toothpick group before and 2 weeks after toothpick toothbrushing method (treatment) had the p = 0.001 (p < 0.05), thus had significant difference (Table 1). The control group had the same result (Table 2). BOP and PD before and 2 weeks after in toothpick and

control groups showed significant difference p = 0.001 (p < 0.05).

Statistical tests results regarding the difference between means before and after using toothpick (treatment group) compared to control group revealed significant difference in all parameters measured (OHI-S, BOP, PD and GI).

DISCUSSION

Periodontal status may influence the performance of oral hygiene and the response of tissues to brushing. Indeed the importance of plaque control and its effectiveness at reducing inflammation. It is appreciated that the toothbrush alone is capable of removing up to 1 mm of subgingival plaque, but is ineffective in the interproximal region so toothpick method is effective in the interproximal.⁸ Mechanical stimulation by toothbrushing promotes healing of gingivitis through accelerating cel proliferation, junctional epithelium proliferates at periodontal pocket formation. Proliferation of basal cell and fibroblast play a major role in maintaining healthy periodontal tissue. Fibroblast as the most predominant cell in connective tissue are engaged in production of collagen fibers.⁹

Before and after study in toothpick method group revealed significant difference which meant that toothpick toothbrushing method was able to increase OHI-S, decrease GI and BOP; the same result occurred with control group (p = 0.001; p < 0.05). Increase of OHI-S index accompanied with increase of gingival index, BOP and pocket depth from toothpick method group was caused by the improvement of dental plaque control pattern with toothpick toothbrushing method. With toothpick toothbrushing method, stimulation proliferation basal cells would reduce gingival bleeding in gingivitis and periodontitis.⁹ Other possibility was the healing effect from scaling therapy. Previous studies revealed the decrease of PD after initial treatment the change of PD condition was influenced by several factors which interrelated to each other. Result analysis showed relations among variables which account for the disease of PD, such as periodontal condition, periodontal disease development and the width of attached gingival.^{10,11} Generally, the result of initial treatment was not only affect PD decrease, but also improves other indexes such as GI and BOP.

The result of both groups showed significant difference between two weeks before and after treatment. It meant that both groups had the ability to improve OHI-S, GI, BOP and PD. Nevertheless, if considering the difference of Means in OHI-S, GI, BOP and PD before and after treatment, in toothpick group had greater value compared to control group (p < 0.05) (Table 3). Toothbrushing promotes the proliferation activity of gingival cells adjacent to the cementum, gingival and the alveolar bone.⁹ Proliferation of fibroblasts were consistent with stress distribution at toothbrushing, but no effects on proliferation of periodontal ligament.

Therefore, it could be confirmed that toothpick toothbrushing method allows dental plaque control superior to common method. A study in Japan compared two toothbrushing method, the toothpick and Bass methods in supragingival plaque removal showed that toothpick method superiorly remove more plaque than Bass method.^{5,6} A 6 months research that was conducted in a Japanese community with toothpick technique revealed that in the 1st and 2nd months observation showed decrease of GI, BOP, and CPITN.^{12,13} Tooth brushing is simple and effective ways to reduce plaque and gingivitis and thus maintain periodontal health. Ohrn and Jonsson¹¹ reported a relationship between periodontal disease and oral health. Toothbrushing contributes to the repair of gingival inflammation and pocket formation. The effects of mechanical stimulation by toothbrushing can reduce gingival bleeding.⁹

Duration and strength of mechanical stimulation were resulted in the activation and proliferation of junctional epithelium basal cell, collagen and gingival cells synthesis, increase of gingival oxygen saturation and stimulates IgA secretion in mucous membrane as humoral immunity towards antigens.^{14,15} Immunoglobulin A is an immunoglobulin class that secreted by gingival crevicular fluid (GCF) and acts as oral mucosal immunity. Gingivitis and periodontitis severity should increase the volume and composition of GCF. Stimulation by tooth brushing enhances the secretion of GCF which carries important components such as Secretory IgA.¹⁶

Neutrophils (PMN) are within the first line of host defense, and by their ability to phagocytize microbes, they can protect the host from infection. They can also give rise to PMN dependent vascular injury and contribute to increased vascular permeability, edema and further release of chemoattractants.⁹ In the periodontal tissue, immune activity works by preventing the penetration of bacteria and its products into the gingival tissue. Tooth brushing has various effect towards periodontal tissue, for example triggering oral epithelium keratinization, enhance gingival capillary circulation, fibroblast proliferation and decreasing inflammatory cells.^{9,15} Host immune factors also plays an important role in tissue healing response; therefore, periodontal tissue healing is affected by various factors which interrelates to each other.

The inconsistent method and time caused the accumulation of plaque which leads to periodontal disease such as gingivitis and periodontitis. Poor oral hygiene is one prime local factor of periodontal disease other than involved factors such as systemic disorders.^{1,3} Good oral hygiene has long been associated with better periodontal health than poor oral hygiene. In order to maintain good oral health to prevent periodontal disease, twice a day toothbrushing frequency is recommended internationally.¹⁷

Gingivitis diminution could be gained by mechanical plaque removal by constant toothbrushing with the right method, in other words, good gingival condition influence to oral health status. The changes of OHI satus, GI, BOP and PD were regarded better in toothpick method group after treatment compared to control. It was concluded that toothpick method is more effective in plaque control compared to common method. Further comprehensive research should be done to evaluate the effectivity of this method towards oral health, especially periodontal disease.

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