

# Evaluation of Relationship between Time of Manual Tooth-Brushing and Plaque Removal

Nishu Vakil<sup>1\*</sup>, Surinder Sachdeva<sup>2</sup>, Pooja Goyal<sup>3</sup>, Abhishek Singh<sup>4</sup>

<sup>1</sup>Department of Periodontology, Indira Gandhi Government Dental College, Jammu and Kashmir 180012, India

<sup>2</sup>Department of Periodontology, MM College of Dental Sciences, Maharishi Markandeshwar (Deemed To Be University), Mullana, Haryana, India

<sup>3</sup>Department of Community Medicine, ESIC Medical College, Faridabad, India

<sup>4</sup>Department of Community Medicine, SHKM Government Medical College, Mewat, Nalhar, Haryana 122107, India

\*Corresponding author: Dr. Nishu Vakil

| Received: 17.05.2019 | Accepted: 25.05.2019 | Published: 30.05.2019

DOI:10.21276/sjodr.2019.4.5.14

## Abstract

**Background:** Individuals should spend at least 2 minutes brushing their teeth with an effective technique at least twice a day. However, most estimates of actual brushing time vary between just over 30 seconds to 60 seconds. **Aim:** To study the relationship between time of manual tooth-brushing and plaque removal. **Methods:** Turesky index was used in this study group to assess the plaques. Brushing times were assigned over a 3 week period and brushing times assigned were 30, 45, 60, 120 and 180 seconds. Dental plaque before and after brushing were evaluated and recorded. **Results:** Changes in Turesky index score for 30 seconds brushing from pre brushing to post brushing were  $3.276 \pm 0.064$  to  $2.628 \pm 0.175$ . For 45 seconds brushing time, pre brushing and post brushing scores were  $3.262 \pm 0.036$  and  $2.648 \pm 0.151$ . Turesky index score for 60 seconds changed from  $3.287 \pm 0.065$  to  $2.562 \pm 0.114$ . for 3 minutes brushing, pre brushing and post brushing scores were  $3.064 \pm 0.071$  and  $2.657 \pm 0.143$ . **Conclusion:** Oral health education towards educating the patients about the duration of brushing time required for plaque removal.

**Keywords:** Brushing time, Turesky index, dental plaque.

**Copyright @ 2019:** This is an open-access article distributed under the terms of the Creative Commons Attribution license which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use (NonCommercial, or CC-BY-NC) provided the original author and source are credited.

## INTRODUCTION

Dental caries, periodontal disease, and tooth loss remain an epidemic health problems are common in children probably due to unsatisfactory brushing practices by majority of them. The normal oral flora can be greatly altered as a result of poor oral hygiene, leading to higher levels and a more pathogenic type of oral flora [1]. A basic approach to addressing these problems has been to seek easier and more effective tooth brushing methods [2, 3].

Intraoral cleaning devices have been a part of human civilization since long and a strong correlation exists between the severity of gingivitis and periodontitis and the accumulation of dental plaque. Tooth brush has undergone a lot of change in every aspect except that the purpose of its action has remained the same to attain a plaque free tooth surface, thereby preventing the initiation and progression of gingival and periodontal disease [4-6]. Various chemical and other mechanical methods have been advocated for this purpose, but tooth brushing has been cited as the most commonly used effective and safest therapeutic method to remove plaque [7].

Amount of force applied and the length of time for which it is used are two important factors that influence the effectiveness of any toothbrush. Individuals should spend at least 2 minutes brushing their teeth with an effective technique at least twice a day. However, most estimates of actual brushing time vary between just over 30 seconds to 60 seconds [8]. Therefore, the present study was to study the relationship between time of manual tooth-brushing and plaque removal.

## METHODS

This cross-sectional study was conducted in a dental hospital of northern India. This investigation intended to measure the plaque removal by manual tooth brushing for different brushing times. A total of fifty subjects participated in this investigation. The subjects consisted of equal number of adult males and females with a minimum plaque score of 2. Subjects with at least 20 gradable teeth and with good physical and oral health participated in the study. No subjects had a history of known sensitivity or oral mucosal tissue reaction to toothpaste.

All subjects were medically fit and none were undergoing antibiotic or anti-inflammatory therapy or had undergone such therapy in the past 6 months. The study design consisted of a non randomised before after one group study. Turesky index was used in this study group to assess the plaques. Subjects were given Colgate 360° whole mouth clean tooth brush and Colgate total tooth paste (1.5g) and were asked to brush for different times on a total of 5 occasions under supervision. Brushing times were assigned over a 3 week period and brushing times assigned were 30, 45, 60, 120 and 180 seconds. Subjects were advised in advance how long they were to brush and the brushing time was divided evenly between four quadrants. Brushing time was measured using a count-down timer. Dental plaque before and after brushing were evaluated and recorded. No prophylaxis was undertaken before the commencement of the study and no attempt was made to modify the volunteers oral hygiene habits.

Written and informed consent was obtained from study subjects. Permission of ethical committee was obtained from the Institutional Ethics Committee. All the questionnaires were manually checked and edited for completeness and consistency and were then

coded for computer entry. After compilation of collected data, analysis was done using Statistical Package for Social Sciences (SPSS), version 21 (IBM, Chicago, USA). The plaque index for various brushing duration were analysed and presented as mean, standard deviation and range. The difference between pre and post brushing at 30, 45, 60, 120 and 180 seconds were calculated and the significance was tested using Friedman test. The results were expressed using appropriate statistical variables.

## RESULTS

Changes in Turesky index score for 30 seconds brushing from pre brushing to post brushing were  $3.276 \pm 0.064$  to  $2.628 \pm 0.175$ . For 45 seconds brushing time, pre brushing and post brushing scores were  $3.262 \pm 0.036$  and  $2.648 \pm 0.151$ . Turesky index score for 60 seconds changed from  $3.287 \pm 0.065$  to  $2.562 \pm 0.114$ . for 3 minutes brushing, pre brushing and post brushing scores were  $3.064 \pm 0.071$  and  $2.657 \pm 0.143$ . The difference between mean pre and post brushing values were found to be statistically significant for all the brushing timings (Table-1).

**Table-1: Change in Turesky index score from pre brushing to post brushing among study subjects**

Brushing time	Pre/post brushing	Mean $\pm$ Std deviation	P value
30 seconds	Pre brushing	$3.276 \pm 0.064$	<0.05
	Post brushing	$2.628 \pm 0.175$	
45 seconds	Pre brushing	$3.262 \pm 0.036$	<0.05
	Post brushing	$2.648 \pm 0.151$	
60 seconds	Pre brushing	$3.287 \pm 0.065$	<0.05
	Post brushing	$2.562 \pm 0.114$	
120 seconds	Pre brushing	$3.376 \pm 0.056$	<0.05
	Post brushing	$2.429 \pm 0.118$	
180 seconds	Pre brushing	$3.064 \pm 0.071$	<0.05
	Post brushing	$2.657 \pm 0.143$	

## DISCUSSION

The most common dental problem of concern in school going children is dental caries. Dental plaque is considered as the possible causative agent of the major dental diseases such as caries and periodontal disease. Plaque as an etiologic agent was first identified in a classic study by Loe *et al.*, in 1965, where it was demonstrated that there was development of gingivitis within a few days of stopping oral hygiene practices. It was attributed to the shift to gram-negative plaque flora, and it was noted that gingivitis was reversible when patients resumed their oral hygiene procedures. The use of preventive procedures to maintain optimal oral health in children is a major concern of the dental profession. An essential element in a preventive dental program, for both the individual and the group, is a well-organized plaque control program [9]. The core of this preventive regimen including the mechanical and chemical plaque control measures is comprehensive home oral hygiene [10].

As periodontal investigation began to discover the aetiological effect of dental plaque and the therapeutic role of oral hygiene became clear [11], various mechanical devices and chemical agents were introduced for plaque control. Although these have been proved to be effective to some extent, but mechanical plaque removal using tooth brush still remains the most popular and effective method [12].

Hawkins *et al.*, [13] evaluated the plaque reduction of a manual toothbrush over four different brushing times. They suggested that there was a 'monotonic' progression of plaque reduction as the brushing time increased. Gibson *et al.*, [14] had shown that effective tooth cleaning is not achieved by detailed instructions at a single visit, including demonstration by the subject. Repetition of the instructions after 3 weeks also did not achieve a higher standard of plaque removal.

We observed in this study that changes in Turesky index score for 30 seconds brushing from pre

brushing to post brushing were  $3.276 \pm 0.064$  to  $2.628 \pm 0.175$ . For 45 seconds brushing time, pre brushing and post brushing scores were  $3.262 \pm 0.036$  and  $2.648 \pm 0.151$ . Turesky index score for 60 seconds changed from  $3.287 \pm 0.065$  to  $2.562 \pm 0.114$ . for 3 minutes brushing, pre brushing and post brushing scores were  $3.064 \pm 0.071$  and  $2.657 \pm 0.143$ . In this study Colgate 360° whole mouth clean tooth brush and Colgate total tooth paste were used. No effort was made to modify the brushing habits of the subjects. Tooth brushing was done under supervision for the stipulated time periods. The results of the study clearly shows that brushing time is an important determinant in plaque removal.

A comparison between brushing time for 45 seconds, an estimate of the average brushing time employed by individuals and 120 seconds being a consensus minimum brushing time recommended by oral health professionals showed statistically significant difference (p value <0.0001) which is in accordance with studies conducted by Hawkins *et al.*, [13] The comparison between brushing times of 120 and 180 seconds showed significant reduction of plaque index (p value <0.0001). Klukowska *et al.*, [15] showed no evidence of increased plaque removal beyond 1 minute, where as in this study plaque reduction was seen consistent with increased brushing duration except between 30 and 45 seconds. The use of dentifrice during tooth brushing is still controversial with many studies supporting the use and some against the use.

## CONCLUSION

On the basis of findings of this investigation, it can be concluded that oral health education towards educating the patients about the duration of brushing time required for plaque removal. Increased brushing duration is directly proportional to increase in plaque removal. Future studies may be carried out to compare the effects of brushing for longer durations and split mouth techniques.

## REFERENCES

1. Sicilia, A., Arregui, I., Gallego, M., Cabezas, B., & Cuesta, S. (2002). A systematic review of powered vs. manual toothbrushes in periodontal cause-related therapy. *Journal of Clinical Periodontology*, 29, 39-54.
2. De la Rosa R, M., Guerra, J. Z., Johnston, D. A., & Radike, A. W. (1979). Plaque growth and removal with daily toothbrushing. *Journal of periodontology*, 50(12), 661-664.
3. Macgregor, I. D. M. (1984). Toothbrushing efficiency in smokers and non-smokers. *Journal of clinical periodontology*, 11(5), 313-320.
4. Van der Weijden, G. A., Timmerman, M. F., Nijboer, A., Lie, M. A., & Van der Velden, U. (1993). A comparative study of electric toothbrushes for the effectiveness of plaque removal in relation to toothbrushing duration: Timerstudy. *Journal of clinical periodontology*, 20(7), 476-481.
5. Newman, M. G., & Nisengard, R. J. (1988). *Oral microbiology and immunology*. WB Saunders Company, 351-366.
6. Bratel, J., & Berggren, U. (1991). Long-term oral effects of manual or electric toothbrushes used by mentally handicapped adults. *Clinical preventive dentistry*, 13(4), 5-7.
7. Turesky, S., Gilmore, N. D., & Glickman, I. (1970). Reduced plaque formation by the chloromethyl analogue of vitamin C. *Journal of periodontology*, 41(1), 41-43.
8. Quigley, G. A., & Hein, J. W. (1962). Comparative cleansing efficacy of manual and power brushing. *Journal of American Dental Association*, 65: 26-29.
9. Bratel, J., & Berggren, U. (1991). Long-term oral effects of manual or electric toothbrushes used by mentally handicapped adults. *Clinical preventive dentistry*, 13(4), 5-7.
10. Schifter, C. C., Emling, R. C., Seibert, J. S., & Yankell, S. L. (1983). A comparison of plaque removal effectiveness of an electric versus a manual toothbrush. *Clinical preventive dentistry*, 5(5), 15-19.
11. Ainamo, J., Xie, Q., Ainamo, A., & Kallio, P. (1997). Assessment of the effect of an oscillating/rotating electric toothbrush on oral health A 12-month longitudinal study. *Journal of clinical periodontology*, 24(1), 28-33.
12. Heasman, P. A., Stacey, F., Heasman, L., Sellers, P., Macgregor, I. D. M., & Kelly, P. J. (1999). A comparative study of the Philips HP 735, Braun/Oral B D7 and the Oral B 35 Advantage toothbrushes. *Journal of clinical periodontology*, 26(2), 85-90.
13. Hawkins, B. F., Kohout, F. J., Lainson, P. A., & Heckert, A. (1986). Duration of brushing for effective plaque control. *Quintessence International*, 17(6): 361-365.
14. Gibson, J. A., & Wade, A. B. (1977). Plaque removal by the Bass and Roll brushing techniques. *Journal of periodontology*, 48(8), 456-459.
15. Klukowska, M., White, D. J., & Barker, M. L. (2008). Effect of Brushing Time on Plaque Removal with Manual Tooth-brushing. *Journal of Dental Research*, 87: 1008.