

Will toothbrushing without toothpaste decrease overall plaque level?

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ABSTRACT

Introduction: Dental disease is more common in Americans than ever before with higher levels of plaque than previously. Toothbrushing and the use of toothpaste has been utilized for many years throughout the nation in order to remove the plaque.

Methodology: This two-part action research study included my personal testing of dry toothbrushing and then three people were asked to follow the test protocol. First, toothbrushing without toothpaste was done for as long as needed for the mouth to feel clean. This was followed by one minute of brushing with toothpaste. Brushing times and plaque levels were measured, plus subjective patient input.

Results: Study participants brushed longer without toothpaste and plaque levels were lower.

Conclusion: Brushing first without toothpaste leads to better plaque removal when compared with their previous toothbrushing with toothpaste.

BACKGROUND

When I was a little girl, I honestly didn't image myself getting older and becoming a dental hygienist. It was simply not in my little bubble of imagination and career choice. I truly didn't even like the dentist as a child, which seemed to have subsided as I grew older. While in high school, I was exploring many different subject areas and medicine and science seemed to have always drawn my attention. The human body truly fascinated me and I craved to know more.

My career path started with the completion of a Certified Nursing Assistant (CNA) Program during my junior year of high school. CNAs work under the supervision of nurses and provide care to patients. I worked as a CNA in a nursing home for about a year and half and then successfully earned a promotion to work in the admission's office. At this point I was set on going into a nursing career. I loved the interaction I had with patients, especially the one-to-one which resulted in me really getting to know my patients personally. Like I stated previously, I loved the communications and relationships I built with my patients, however when I received my promotion into the admission's office as an assistant, I soon realized this wasn't the path for me. Working behind the scenes and not taking care of the patients did not appeal to me. I was simply doing all the necessary paperwork. Getting to know the true responsibilities of the nurses was intriguing. It amazed me to know that the patient to nurse ratio was so high; about 25-30 patients per one nurse, even on rehabilitation. It is estimated that as many as 95 percent of the nursing homes in America may be understaffed¹.

This new position had opened a new insight into the nursing career path. I saw how much paperwork was involved and the relationship between patient and nurse wasn't necessarily always so comforting. Patients became a number on a piece of paper rather than an actual human being. I didn't want to do this; I wanted that connection I first felt when I was an aide.

And off with my career research I began. I wanted to stay in medicine, but I wanted to also have the ability to truly have some type of interaction with my patients. A friend of mine said her aunt was a dental hygienist and she loved it. To be honest, at this moment, I truly didn't understand the responsibilities of a dental hygienist. After completing a little bit of research I found that having the ability to be with the patient for an hour or so was what I wanted. I was able to be in charge of their oral care and make decisions that I knew could help my patient. It was decided that I would apply to a dental hygiene school. After two years of prerequisites I was accepted to Lincoln College of New England, located in Southington, CT, USA. This was the beginning of the rest of my career that consisted of educating, charting, and most importantly the one thing hygienist crave, calculus removal!

After completing my degree in dental hygiene and receiving an Associate's of Science Degree in the year 2015, I started my first ever job as a dental hygienist in a private office, part-time. Although I was only working two days a week, I truly loved it. Having the ability to see my patients improve significantly from their first visit to their 6-month visit was so rewarding and truly made me feel good. My old job as an admission assistant started to fade as I received an opportunity to work full-time in a private dental office with part of the time in clinical hygiene and rest at the front desk.

As a new dental hygiene graduate working for not even a year, I soon realized how much I truly enjoyed going into work every day. My office was quite the tech savvy office, with flat screens available for patients in front of them so they can view radiographs just like I do. Giving the patients this ability to see exactly what I was viewing in their mouth with the use of an intra oral camera really lets them understand what is happening. Many may say that new graduates have a disadvantage, as they have not experienced as many different scenarios or had as much patient contact time as experienced hygienists. I find that new graduates are able to be molded into something much bigger and have the ability to adapt to new ideas and thoughts more easily than someone who has been in the field for quite some time. Our heads are prefilled with concepts and core values that many have believed in the hygiene field and I believe it's time for a change. As a new graduate I constantly am flexible to the ever-changing world of hygiene. Every year and every new research finding that comes out clearly demonstrates the constant change in healthcare. In order to move up and move anywhere we must have the ability to adapt to new ideas and new patient expectations.

INTRODUCTION

The one idea I seemed to ponder was the reality of patients never really brushing accurately. As a dental hygienist, I had always been taught that manual removal of plaque was the key to healthy gums and in conjunction with toothpaste we would create an oral cavity free of cavities and gum disease. However, I wondered how true is the concept of brushing with toothpaste? Is it even a possibility that toothpaste isn't an essential component in the maintenance of the oral cavity?

I started noticing that more of my patients were coming in without an increase in calculus, but instead plaque, that could be easily removed at home. I was surprised how many patients truly believed they were brushing well and swore that they constantly feel like their teeth are clean.

The repeating question from my patients was: "What kind of toothpaste do you recommend?" To be honest, this is one of those questions the answer to which I didn't really know. I had been taught that any toothpaste with fluoride was necessary in order to protect teeth from getting tooth decay. Of course there were always different toothpastes for patients who experienced sensitivity. I thought to myself, do we honestly need toothpaste and does it really have an effect on plaque removal?

This is where my research began. Reading through research studies, it became clear that "...the precise role of dentifrice in plaque removal has been debatable."² We all naturally love toothpaste as it truly makes our mouth feel like it's clean. The keyword in this statement is "feel," but are our teeth brushed clean and plaque free with dentifrice?

Let's start off with what toothpaste is exactly. According to the American Dental Association (ADA), toothpastes "...are pastes, gels, or powders that help remove plaque, a film of bacteria that forms on teeth and gums. Toothpaste improves the mechanical brushing and cleaning power of a toothbrush"³. Isn't it amazing to know that toothpaste is actually supposed to help remove plaque. Well this certainly answered questions for many patients who believed that using toothpaste was actually beneficial for their oral health. The ADA even claims that the purpose of toothpaste is to make mechanical brushing more effective. The idea that a gel or powder can make your hand

movement more efficient is quite absurd. It is no surprise that so many patients and health care professionals believe that toothpaste has a key role in keeping their mouths healthy.

Digging a little deeper into the toothpaste research, it became clear that in general, toothpaste includes “abrasives, binders, foaming ingredient, humectants, detergents, flavors, colors, preservatives, fluoride and water”³. I absolutely agree that fluoride is definitely an active ingredient that must be utilized for all patients in order to protect and keep their teeth healthy and strong. Other ingredients that were listed like flavors, abrasives, and even surfactants seem not to be as beneficial as we previously thought.

Flavors are added in order to make the toothpaste more enjoyable. No one wants to be brushing their teeth with something that doesn't taste good. In fact, many companies have developed all sorts of different flavors in order to attract more customer purchases. From chocolate to even strawberry, you name it and it's out there. Patients want a toothpaste that tastes good and makes their mouth feel like it's clean.

The surfactant, usually sodium lauryl sulfate, is used as a detergent and foaming agent in toothpaste³. This foaming action, which is common in most toothpastes, may cause the patient to stop brushing after seconds, because their mouth is filled with bubbles. Many patients believe using more of a product will be better to protect their teeth and gums when in reality instructions listed are intended to be followed. Most toothbrushing instructions suggest a pea size amount of toothpaste on the toothbrush. With this foaming action comes consequences. Most patients are not able to see and feel where their teeth are in their mouth.

One study confirmed that using a dry toothbrush reduced patients' calculus deposits on the lingual surfaces of the lower anterior teeth by 67% and gingival bleeding by 50%⁴.

A personal goal of mine is to improve my patients' overall oral health, therefore I became quite concerned that what I was recommending wasn't effective. The traditional toothbrushing with toothpaste message presented to patients is a generalized concept passed from generation to generation. In one study it was suggested that using toothpaste "...does not enhance plaque removal when used in conjunction with a toothbrush, and instead, may marginally lessen the brushing effect. The role of a toothbrush appears to be more crucial in the maintenance oral hygiene"¹. To answer the question about the value of toothpaste, I developed an action research question: Will toothbrushing without toothpaste decrease my patient's overall plaque level? The goal of this research project was to evaluate the effect on plaque of dry toothbrushing compared to toothbrushing with toothpaste.

METHODOLOGIES

To answer this question, I anticipated inviting my patients into the study, however with time constrictions, this was not possible. Instead, I asked three of my friends to participate. Each subject was asked to sign an informed consent form. *Appendix A*

To better understand what I would be asking patients and friends to do, I followed the dry toothbrushing instructions myself. For one week, I brushed with a manual toothbrush without toothpaste for as long as I needed in order for my teeth to feel clean, followed by a one-minute of toothbrushing with toothpaste. The toothpaste provided

the benefit of fluoride to protect my teeth. My second week included toothbrushing with an electric toothbrush for as long as I need until I felt my teeth were clean. This provided a comparison between different tools utilized in dry brushing. I followed this dry toothbrushing with one additional minute with toothpaste. Each day I would record how long it took me to brush my teeth until they felt clean.

After completing the experimental process myself, I invited my three friends to begin. The first week they used a manual toothbrush, brushing without toothpaste first until their teeth felt clean, followed by one-minute of toothbrushing with toothpaste. This process was repeated the second week with an electric toothbrush. They were monitored daily through various communications in order to assure they had completed the dry toothbrushing as instructed. They were provided with forms to fill out for week one with a manual toothbrush and week two with an electric toothbrush.

GATHERING AND INTERPRETING DATA

When beginning this project, I was really apprehensive that things would not go as I had planned, however I was quite satisfied. Individual tracking forms recording the time of toothbrushing each day are found in *Appendix B*.

Plaque scores were measured using the Silness and Loe Index⁵. This index follows the criteria outlined Table 1. Plaque is measured on four surfaces of each tooth (buccal, lingual, mesial and distal) and is given a score from 0-3. The scores from the four areas of each tooth are added and divided by four in order to give a plaque index number for the tooth⁵.

Score	Criteria
0	No plaque
1	A film of plaque adhering to the free gingival margin and adjacent area of the tooth. The plaque may be seen in situ only after application of disclosing solution or by using the probe on the tooth surface.
2	Moderate accumulation of soft deposits within the gingival pocket, or the tooth and gingival margin which can be seen with the naked eye.
3	Abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin.

Once getting a plaque index number for each of the six selected teeth, which according to the Silness-Loe these teeth were 3, 7, 13, 19, 23, 28⁵, the next step would be to accumulate all these numbers and divide them by the number of teeth you included in the grading. An example is as follows: "For instance, if you have the following indices for the teeth:

Tooth	Index
Maxillary right first molar (16)	1. 5
Maxillary right lateral incisor (12)	1. 3
Maxillary left first bicuspid (24)	1. 2
Mandibular left first molar (36)	1
Mandibular left lateral incisor (32)	1. 6
Mandibular right first bicuspid (44)	1. 3

Then the index for the patient will be

The index for patient = $(1. 5 + 1. 3 + 1. 2 + 1 + 1. 6 + 1. 3) / 6 = 1. 4$

You would assume that in fact this patient's plaque index is quite low. Please refer to *Appendix C* to see individual subject's plaque scores. The data from the three test subjects before and after the study revealed a decrease of over 9% in plaque after one week. With an electric toothbrush there was a 14% decrease in plaque scores. All three test subjects showed an increase in toothbrushing times. When brushing with a manual toothbrush, the average time was 3.8 minutes. Brushing with an electric toothbrush was 2.7 minutes. Both times are significantly higher than the American Dental Hygienists' Association recommended time of two minutes.

DISCUSSION

The brushing times for these subjects showed that more than two minutes were needed for them to feel that their teeth were clean. To see that not just one but all test subjects brushed for longer than two minutes makes me question the validity of recommending two minutes.

My results show that toothpaste is not needed nor is toothpaste a big factor in eliminating plaque. Increasing the time spent brushing⁸ and not adding a dental toothpaste will effectively remove plaque. There are several studies that indicate the use of toothpaste does not increase plaque removal during toothbrushing⁸. With evidence to the contrary, why are dental hygienists still recommending the use of toothpaste? Why are we not informing our patients that toothpaste is just causing their brushing techniques to be ineffective and reducing time spent brushing?

As astonished as I was by what I had learned from this study, it was interesting to

know that not only are most patients still brushing with toothpaste, but the idea of not brushing with one is quite hidden. According to Trisha O’Hehir, a researchers of the dry brushing—inside first concept,⁹ this idea is a well-kept secret.⁹ People need to hear a message seven to 10 times before they act on it⁹. We know how to can help our patients reduce their plaque yet the dry toothbrushing message isn’t being heard. This makes me wonder if the TV commercials for toothpaste are that much louder than common sense. Perhaps it is time to re-think our standard message for daily oral hygiene.

A new company has launched a line of children’s toothbrushes that need no toothpaste. Most children honestly don’t like using toothpaste and think it’s quite disgusting so they will like this idea. Crystal Animals, manufactured by Thera Wise, provide young children with a toothbrush that specifically instructs “no toothpaste needed”¹⁰. Now you must be thinking why would a company make a toothbrush and not recommend using toothpaste in conjunction. It turns out that these fancy toothbrushes contain antibacterial properties within the natural mineral bristle that keep the mouth feeling fresh and clean all day¹⁰. The company even claims that the natural mineral bristles produce a charge that makes the tooth surface slippery so bacteria and plaque won’t stick. This makes removal much easier¹⁰. That’s pretty impressive if you ask me. To know that there are actually toothbrushes out in the market today that help with plaque removal and advise patients not to brush with toothpaste proves that maybe we have started a revolution. The only issue is that we don’t really see this in adult toothbrushes. Let’s be honest, the toothpaste industry is worth millions. Colgate, one of the top brand names known to people, makes an “annual profit of over \$83.2 million

dollars”¹¹. With that kind of money it’s no wonder why toothpaste seems to be the big seller in dentistry. I agree that toothpaste does have value, as it protects our teeth from cavities, however our approach to oral hygiene needs to be updated.

CONCLUSION

By teaching people to first brush their teeth without toothpaste until they felt clean and then using toothpaste, they were able to remove more plaque. Following this approach, they actually brushed longer. By showing patients the proper way of brushing without toothpaste, we will significantly reduce plaque and from there, perhaps oral disease.

Word Count: 3105

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APPENDIX A

INFORMED CONSENT FOR RESEARCH STUDY

INTRODUCTION

You are being asked to take part voluntarily in the Research project described below. Please take your time making a decision and feel free to discuss it with your friends and family. Before agreeing to take part in this research study, it is important that you read the consent form that describes the study. Please ask the study researcher or the study staff to explain any words or information that you do not clearly understand.

WHY IS IT BEING DONE?

You have been asked to take part in a research study of the effect of dry brushing will have on your oral health which will be accessed via plaque index. Approximately, two study subjects, will be enrolling in this study at each individual homes. You are being asked to be in the study because you are an ideal candidate that meets requirements for this study. If you decide to enroll in this study, your involvement will last about 2 weeks for each individual in this study.

WHAT IS INVOLVED IN THIS STUDY?

If you agree to take part in this study, the research team will; Describe all procedures, and any review of records, interviews, questionnaire's, etc. that will take place.

WHAT ARE THE RISK AND DISCOMFORTS OF THE STUDY?

There is no known risk associated with this research.

WHAT WILL HAPPEN IF I AM INJURED IN THIS STUDY?

O'Hehir University and the study research and its affiliates do not offer to pay for or cover the cost of medical treatment for research related illness or injury. No funds have been set aside to pay or reimburse you in the event of such injury or illness. You will not give up any of your legal rights by signing this consent form. You should report any such injury to Marlena Tomaszewski, 860 680 2729.

ARE THERE BENEFITS TO TAKING PART IN THIS STUDY?

There will be no direct benefits to you for taking part in this study. This research may help us to understand that significance in brushing methods without any toothpaste in order to improve oral health.

WHAT OTHER OPTIONS ARE THERE?

You have the option not to take part in this study. There will be no penalties involved if you choose not to take part in this study.

WHO IS PAYING FOR THIS STUDY?

There is no required funding for this study. Subjects are Provided with the necessary tools in order to successful complete the requirements of this study.

WILL I BE PAID TO PARTICIPATE IN THIS STUDY?

You will not be paid for taking part in this research study.

WHAT IF I WANT TO WITHDRAW, OR AM ASKED TO WITHDRAW FROM THIS STUDY?

Taking part in this study is voluntary. You have the right to choose not to take part in this study. If you do not take part in the study, there will be no penalty.

If you choose to to take part, you have the right to stop at any time. However, we encourage you to talk to a member of the research group so that they know why you are leaving the study. If there are any new findings during the study that may affect whether you want to continue to take part, you will be told about them.

The research may decide tot stop your participation without your permission, if he or she thinks that being in the study may cause you harm.

WHO DO I CALL IF I HAVE QUESTIONS OR PROBLEMS?

You may ask any question you have now. If you have questions later, you may call Marlena Tomaszewski at 860-680-2729 or email at marlenardh@icloud.com. Please allow two business days in order to get your reply back.

If you have questions or concerns about your participating as a research subject, please contact Marlena Tomaszewski as mentioned above.

WHAT ABOUT CONFIDENTIALILTY?

Your Part in this study is confidential. None of the information will identify you by name. All records will be kept secured and only available to the study researcher. You will referred to as Subject 1, 2, and etc.

MANDATORY REPORTING

If information is revealed about child or elder abuse or neglect, or potentially dangerous future behavior to others, the law requires that this information be reported to proper authorities.

AUTHORIZATION STATEMENT

I have read each page of this paper about the study (or it was read to me). I know that being in this study is voluntary and I choose to be in this study. I know I can stop being in this study without penalty. I will get a copy of this consent form now and can get information on results of the study later if I wish.

Participant name: _____

Date: _____

Participant Signature: _____

Date: _____

Participant or Parent/Guardian Signature:

Consent form explained/witnessed by:

Printed Name:

Date: _____

Time: _____

APPENDIX B

Name: PATIENT A
Start Date: MAY 15 2016 End Date MAY 28 2016

Instructions:

1. WEEK1: Brush the first week (exactly 7 days) with a manual toothbrush with no toothpaste until you feel like your teeth are clean. Remember after you feel like you did a good job, go back and brush with an additional minute to receive the benefit of fluoride. Document how long it took you to brush without adding the additional min at the end for each consecutive day.
2. WEEK2: Brush your teeth the second week (exactly 7 days) with an electric toothbrush with no toothpaste until you feel like your teeth are clean. Remember after you feel like you did a good job, go back and brush with an additional minute to receive the benefit of fluoride. Document how long it took you to brush without adding the additional min at the end for each consecutive day.

WEEK 1		WEEK 2	
Manual Toothbrush		Electric Toothbrush	
DAY 1	TIME: 3.9m	DAY 1	TIME: 2.8m
DAY 2	TIME 3.85m	DAY 2	TIME 2.85m
DAY 3	TIME 3.84m	DAY 3	TIME 2.75m
DAY 4	TIME 3.79m	DAY 4	TIME 2.7m
DAY 5	TIME 3.85m	DAY 5	TIME 2.76m
DAY 6	TIME 3.76m	DAY 6	TIME 2.73m

DAY 7 TIME 3.75m

DAY 7 TIME 2.70m

Name: PATIENT B

Start Date: MAY 15 2016 End Date MAY 28 2016

Instructions:

1. WEEK1: Brush the first week (exactly 7 days) with a manual toothbrush with no toothpaste until you feel like your teeth are clean. Remember after you feel like you did a good job, go back and brush with an additional minute to receive the benefit of fluoride. Document how long it took you to brush without adding the additional min at the end for each consecutive day.
2. WEEK2: Brush your teeth the second week (exactly 7 days) with an electric toothbrush with no toothpaste until you feel like your teeth are clean. Remember after you feel like you did a good job, go back and brush with an additional minute to receive the benefit of fluoride. Document how long it took you to brush without adding the additional min at the end for each consecutive day.

WEEK 1

Manual Toothbrush

DAY 1 TIME: 4.0m

DAY 2 TIME 4.2m

DAY 3 TIME 4.1m

DAY 4 TIME 3.9m

DAY 5 TIME 3.85m

DAY 6 TIME 3.68m

WEEK 2

Electric Toothbrush

DAY 1 TIME: 3.0m

DAY 2 TIME 2.85m

DAY 3 TIME 2.83m

DAY 4 TIME 2.82m

DAY 5 TIME 2.85m

DAY 6 TIME 2.9m

DAY 7 TIME 3.6m

DAY 7 TIME 2.70m

Name: PATIENT C

Start Date: MAY 15 2016 End Date MAY 28 2016

Instructions:

1. WEEK1: Brush the first week (exactly 7 days) with a manual toothbrush with no toothpaste until you feel like your teeth are clean. Remember after you feel like you did a good job, go back and brush with an additional minute to receive the benefit of fluoride. Document how long it took you to brush without adding the additional min at the end for each consecutive day.
2. WEEK2: Brush your teeth the second week (exactly 7 days) with an electric toothbrush with no toothpaste until you feel like your teeth are clean. Remember after you feel like you did a good job, go back and brush with an additional minute to receive the benefit of fluoride. Document how long it took you to brush without adding the additional min at the end for each consecutive day.

WEEK 1

Manual Toothbrush

DAY 1 TIME: 3.85m
DAY 2 TIME 3.89m
DAY 3 TIME 3.82m
DAY 4 TIME 3.84m
DAY 5 TIME 3.85m

WEEK 2

Electric Toothbrush

DAY 1 TIME: 2.7m
DAY 2 TIME 2.65m
DAY 3 TIME 2.75m
DAY 4 TIME 2.8m
DAY 5 TIME 2.86m

DAY 6 TIME 3.76m

DAY 6 TIME 2.73m

DAY 7 TIME 3.73m

DAY 7 TIME 2.60m

APPENDIX C

PLAQUE INDICIES FOR EACH INDIVIDUAL PATIENT BEFORE/AFTER						
	PATIENT A		PATIENT B		PATIENT C	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER
MANUAL	1.9	1.7	2.4	2.1	1.8	1.73
ELECTRIC	1.7	1.4	2.1	1.8	1.7	1.5

PERCENTAGE OF DECREASE IN PLAQUE SCORES INDIVIDUALLY						
	PATIENT A		PATIENT B		PATIENT C	
MANUAL	11%		12.5%		4%	
ELECTRIC	17%		14%		12%	

PERCENTAGE OF DECREASE AVERAGE OVERALL	
MANUAL	9.2%
ELECTRIC	14%