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How Technology Can Improve Oral Hygiene and Overall Health with the Use of Electronic Toothbrushes

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Abstract

Purpose. To demonstrate that technology can improve oral hygiene which will contribute to improved overall health with the use of electronic toothbrushes.

Methods. This is a two part study. The first part will include 12 individuals divided into three groups with 4 persons per control group; depending on the toothbrush they use on a regular basis. The three types of toothbrushes utilized will be manual, Sonicare and Oral-B. All individuals will be examined and scored based on their level of gingival inflammation using the Silness-Loe index along with a plaque index measurement at the neck of each tooth. The second part of my study will involve two people who regularly use a manual toothbrush. They will be switched to an electronic toothbrush. Initially, they will be examined and their oral hygiene scored after using a manual toothbrush. They will then be examined several times over nine weeks while using an automatic toothbrush to determine if their oral hygiene has improved.

Hypothesis. Electronic toothbrushes will do a better job removing plaque from the teeth therefore improving oral health.

Introduction

Oral hygiene and its effect on overall health is of great importance. It is essential to maintain a clean mouth to prevent tooth decay and gingival disease. If bacterial plaque is not swept away from teeth and gums, it eventually becomes calculus; a hard yellowish deposit formed from plaque that is not removed. Calculus is increasingly difficult to eliminate and provides a perfect environment for further plaque accumulation thus perpetuating the disease cycle (Thivierge, 2010). By practicing good oral hygiene on a regular basis, disease promoting

plaque is eliminated. Toothbrushes are the main tool for removing plaque from the teeth and gums and proper brushing is a vital part of maintaining good oral hygiene. The predicament is that many people do not know how to utilize a manual toothbrush correctly and do not brush for a sufficient amount of time. This leads to a higher plaque index causing gingivitis, periodontal disease and other health issues. Electronic toothbrushes were introduced in 1961 by General Electric to replace the existing manual toothbrush. With time, a variety of electronic toothbrushes have been developed. Today, the two most popular ones are the Sonicare and the Oral-B (Abyss, 2009).

There are several reasons why electronic toothbrushes are superior to manual ones. As previously mentioned, many people do not know how to correctly use a manual toothbrush; using an electronic toothbrush can be a solution. Electronic brushes are convenient to use and require minimal effort. The patient gently places the toothbrush on the surface of the teeth at a 45 degree angle to the gum and lets the toothbrush do its job. People also tend to brush longer with electronic toothbrushes because they have a built in timer. These timers advise the patient when to go to the next quadrant and when to stop. The bristles of an electronic toothbrush can move at a rate of thousands of times per minute compared to a manual toothbrush which can move at a rate of hundreds of times per minute. This leads to better removal of dental plaque (Abyss, 2009). Other reasons to use the electronic toothbrush are the movements they create to remove plaque as well as their ability to get at hard to reach places. The Sonicare toothbrush operates with a high vibration sonic technology, moving the bristles side to side. Its bristles reach a great velocity with high frequency and high amplitude bristle motion of 260 Hz. This movement forces fluid deep into interproximal spaces and at the gum line ("Philips Sonicare," 2001). The other popular electronic toothbrush is the Oral-B. This type of toothbrush uses an

oscillating-rotation and pulsating frequency moving at 8,800 oscillations/40,000 pulsations per minute. This brush movement also reaches the interproximal spaces of the teeth as well as at the gum line (Biesbrock, Walters, Bartizek, Goyal, & Qaqish, 2008).

The probable link between oral plaque and heart disease is unquestionably a scientific concern. Therefore, eliminating as much oral bacteria as possible is imperative to overall health. According to a survey to assess health status, conducted in Scotland every three to five years between 1995 and 2003, poor oral hygiene can increase the risk of cardiovascular disease via systematic inflammation. In this study the interviewers visited households, took height and weight measurements and asked questions about demographics including questions on oral health. Some questions included the frequency of dental visits and how often were they using a tooth brush. On subsequent visits the nurses took blood pressure readings and blood samples and collected their family history of cardiovascular disease. It was found that only 4.5 percent of the population reported poor oral hygiene habits; like brushing less than once a day. These subjects also rarely visited the dentist, smoked, and were obese with diabetes and high blood pressure. A 70 percent increased risk of fatal and non-fatal cardiovascular disease was found in this group when compared to subjects with the same factors, the only difference being that they brushed regularly. This study also suggested that poor oral hygiene correlates with elevations in the concentration of C-reactive protein (CRP) and fibrinogen ("Tooth brushing," 2010). CRP is a protein that is released into the blood when there is inflammation in the body, and coronary artery disease is an example of an inflammatory process. Fibrinogen is a blood clotting factor and most heart attacks are produced by a sudden blood clot forming in the site of atherosclerotic plaque. Both CRP and fibrinogen are great predictors of future heart disease if found in blood tests (Fogoros, 2011).

Experienced dental personnel agree that electronic toothbrushes improve oral health. Patricia Hocker RDH, who has been a hygienist for almost thirty years, and who is considered to be "a connoisseur of good oral hygiene" is one to concur.   Through the years, having many patients that she sees on a regular basis, she has been able to observe the true difference between manual toothbrushes and electronic ones. She confirms that when her dental office changed to using the electronic toothbrushes, "it was a real eye opener. Switching motivated patients to a Braun Oral B or Sonicare had a positive effect on the oral health of almost every patient".   She goes on to explain that since the automatic toothbrushes have a great number of brush strokes per minute, they are "more effective in dislodging plaque". Hocker also thinks that the built-in timer that comes in these brushes have been great at "eliminating under brushing which is shown to be one of the leading causes of poor dental hygiene". Overall, she understands that these brushes can be costly, but they are a great "investment for long term oral health" (Patricia Hocker, personal communication).

Methods

This was a two part study that was performed with the collaboration of Dr. Roman Manetsch, Assistant Professor at the Department of Chemistry. It was executed at the Advanced Dental Cosmetic Center, located in Bradenton, Florida, under the supervision of J. Terry Alford D.M.D. and Patricia Hocker RDH. Each patient was given a written informed consent document that was signed to ensure the understanding of the risks and benefits of the study.

Subjects. Fourteen adult individuals from ages 20 to 70 years of age volunteered for this study. Each individual was required to use a specific toothbrush on a regular basis; manual, Sonicare or Oral-B toothbrush, depending on the group they were participating in. There were

no exclusions based on sex or race. Individuals were only excluded if they would not brush on a regular basis or did not have enough teeth for the calculations to be done.

General Procedure. The selected individuals were examined and scored based on the level of gingival inflammation index of Silness-Loe, the plaque index based on the plaque assessment scoring system measuring the neck of each tooth. A specific index was developed by Loe and Silness to be able to measure the Gingival Index (GI) based on the gingival inflammation, as seen in Table 1.

Appearance	Bleeding	Inflammation	Points
normal	no bleeding	none	0
slight change in color and mild edema with slight change in texture	no bleeding	mild	1
redness, hypertrophy, edema and glazing	bleeding on probing/pressure	moderate	2
marked redness, hypertrophy, edema, ulceration	spontaneous bleeding	severe	3

Table 1. Gingival Index guide by Loe and Silness (10).

There were 6 teeth examined; the maxillary right first molar, the maxillary right lateral incisor, the maxillary left first bicuspid, the mandibular left first molar, the mandibular left lateral incisor and the mandibular right first bicuspid. If any of these teeth were missing, the adjacent present tooth was used. The surfaces to be examined on each of the selected teeth were: buccal, lingual, mesial and distal. To calculate the GI, the tooth was examined and assigned an appropriate number from Table 1 on each surface. An average was determined by calculating the acquired points for the four existing surfaces. Then an average was taken for the type of teeth examined: molars, bicuspids and laterals. Finally a GI for the patient was calculated by averaging the total gingival indices for each of the 6 teeth selected (Pope, 1995). The results are explained by Table 2.

Average Gingival Index	Interpretation
2.1 - 3.0	severe inflammation
1.1 - 2.0	moderate inflammation
0.1 - 1.0	mild inflammation
< 0.1	no inflammation

Table 2. Interpretation of the GI results (10)

To inspect the gingival inflammation index of Silness-Loe a periodontal probe was used. This instrument measures the space between the teeth and the gum to determine if there are periodontal pockets present, indicating the presence of gum disease. Gum disease is caused by plaque, which is a sticky film of bacteria. This can be removed with proper brushing (American Dental Association, 2001). The plaque assessment scoring system (PASS) was used to examine the plaque index. For this system, 5 teeth were selected; 4 first molars and one anterior, if missing, the adjacent tooth was substituted. The four surfaces of each tooth (lingual, facial, mesial and distal) were swiped with the same periodontal probe noting any visible plaque at the tip of the instrument. Each area that had plaque was marked. Of the teeth selected there would be a total of 20 areas. A percentage was taken following the equation:

$\frac{Areas\ without\ plaque}{Total\ areas} = plaque\ \%.$ A score above 75% indicated the patient is maintaining gingival health. A score below 75% indicated decreased gingival health with a tendency toward dental caries (Wilkins, 2009). After all the examinations were done, photographs were taken only on the patients on the second part of the study.

First Part. Twelve individuals were selected as a comparison group. They were subdivided into three groups with four people per group. Each person was interviewed to distinguish their routine oral health care. Group I used manual toothbrushes on a regular basis, Group II used the Sonicare toothbrush on a regular basis and Group III used the Oral-B toothbrush on a regular basis. Throughout the semester, the twelve individuals were examined and scored based on the

level of gingival inflammation index of Silness-Loe and the plaque index based on the plaque assessment scoring system, as explained in the previous section. All findings were recorded and used as comparisons to reinforce the thesis. They were also the foundation for the second part of the research.

Second Part. This part involved two individuals that regularly used a manual toothbrush. They were given an electronic toothbrush and over a period of two months, they were observed for any improvements. During the first visit, both of these patients were examined and scored based on the level of gingival inflammation index of Silness-Loe and the plaque index based on the plaque assessment scoring system measuring the neck of each tooth. Pictures were also taken. The patients were given their new electric toothbrush. Patient A took the Sonicare and Patient B the Oral-B. They were both instructed on how to use their new electronic toothbrushes. They were also asked not to change their oral hygiene routine; continuing with the same flossing habits and toothpaste. No prophylaxis would be performed during the study. The only thing they changed was their toothbrush. This ensured that any difference in their oral hygiene would be due to the toothbrush. After using the electronic toothbrushes for three weeks, both patients returned for their second visit. At this time, the same examination and scoring was done as in visit 1. Three weeks later, during their third visit, both patients were reexamined. Finally, they both came in three weeks later for their last visit. At this point, they had their gingival inflammation and plaque scored. Pictures were taken for comparison. They were also asked to describe their experience using an electronic toothbrush and whether they noticed any change.

Results

First Part.

Twelve individuals were selected, examined and scored. Tables were assembled with the respective findings. Since this section is used for comparison, averages were used for a more accurate assessment of each type of toothbrush.

Group I. Four individuals were selected to represent manual toothbrush users. They were examined and scored with the group results shown in Table 3.

	Patient 1 Manual	Patient 2 Manual	Patient 3 Manual	Patient 4 Manual	Average of Manual Patients
Gingival index	.79	.71	1	.71	.80
Plaque index	35%	45%	35%	40%	38%

Table 3. Overall results of the individuals using manual toothbrush.

As seen above, the Silness-Loe Gingival Index denotes, on average, individuals who use manual toothbrushes have a GI of .80 indicating mild gingival inflammation. Upon measuring their plaque index, they have an average of 38% according to PASS. This is way below the acceptable 75% signifying poor gingival health and a caries prone environment. The Silness-Loe GI was determined with the scores shown in Table 4.

Manual	Patient 1	Patient 2	Patient 3	Patient 4
Maxillary right first molar	1.25	1	1	.75
Maxillary right lateral incisor	.5	.5	1	.75
Maxillary left second bicuspid	1	.5	1.25	.5
Mandibular left first molar	1.25	.75	1.25	.75
Mandibular left lateral incisor	0	.5	.75	.5
Mandibular right first bicuspid	.75	.75	.75	1
Average Molars	1.25	.875	1.13	.75
Average Laterals	.25	.5	.875	.625
Average Bicuspids	.875	.75	1	.75
Total score	.79	.71	1	.71

Table 4. Scoring for Silness-Loe Gingival Index in manual toothbrush users.

The PASS plaque index score for each patient using a manual toothbrush is determined below:

Patient 1: $\frac{7}{20} = 35\ \%$. Patient 2: $\frac{9}{20} = 45\ \%$. Patient 3: $\frac{7}{20} = 35\ \%$. Patient 4: $\frac{8}{20} = 40\ \%$.

Results of the GI and PASS were averaged and are found in Table 3. Most of the patients from

Group I had pink, stippled gingiva. However, in some areas it was flaccid. This was an

observation that confirmed my expectations, on what the gum tissue should look like. Also,

there was some interproximal bleeding upon probing.

Group II. Four individuals were selected to represent Sonicare toothbrush users. They were

examined and scored with the group results seen in Table 5.

	Patient 1 Sonicare	Patient 2 Sonicare	Patient 3 Sonicare	Patient 4 Sonicare	Average of Sonicare Patients
Gingival index	.58	1	.25	.125	.48
Plaque index	85%	70%	90%	90%	84%

Table 5. Overall results of the individuals using Sonicare toothbrush.

Table 5 indicates that on average Sonicare users have a Silness-Loe Gingival Index of .48,

indicating mild gingival inflammation. Also, these individuals had an average plaque index of

84%. This is indicative of good oral hygiene since it is above the acceptable 75%. The Silness-Loe GI was determined using the scores shown in Table 6.

Sonicare	Patient 1	Patient 2	Patient 3	Patient 4
Maxillary right first molar	.75	1.5	.75	.25
Maxillary right lateral incisor	.5	1	.25	0
Maxillary left second bicuspid	.5	1.25	.5	0
Mandibular left first molar	1.25	1.5	0	.25
Mandibular left lateral incisor	0	.5	0	0
Mandibular right first bicuspid	.5	.75	0	.25
Average Molars	1	1.5	.375	.25
verage Laterals	.25	.75	.125	.0
Average Bicuspids	.5	1	.25	.125
Total score	.58	1	.25	.125

Table 6. Scoring for Silness-Loe Gingival Index in Sonicare toothbrush users.

The PASS plaque index score for each patient using a Sonicare is determined below:

Patient 1: $\frac{17}{20} = 85$ %. Patient 2: $\frac{14}{20} = 70$ %. Patient 3: $\frac{18}{20} = 90$ %. Patient 4: $\frac{18}{20} = 90$ %.

Results of the GI and PASS were averaged and are found in Table 5. When examining the patients in Group II it was observed that most of them had pink, firm, stippled gingiva and interproximal bleeding upon probing was minimal to none.

Group III. Four individuals were selected to represent Oral-B toothbrush users. They were examined and scored with the group results shown in Table 7.

	Patient 1 Oral-B	Patient 2 Oral-B	Patient 3 Oral-B	Patient 4 Oral-B	Average of Oral-B Patients
Gingival index	1	.33	.75	.71	.69
Plaque index	60%	80%	80%	90%	78%

Table 7. Overall results of the individuals using Oral-B toothbrush.

Table 7 shows the average scores for Oral-B toothbrush users. They have a Silness-Loe Gingival Index average of .69 indicating mild gingival inflammation. In these same individuals the average plaque index was 78%. This is above 75% indicating good oral hygiene. The Silness-Loe GI was determined with the scores shown in Table 8.

Oral-B	Patient 1	Patient 2	Patient 3	Patient 4
Maxillary right first molar	1.25	.25	1	.75
Maxillary right lateral incisor	1	.25	.75	.5
Maxillary left second bicuspid	1	.75	.75	1
Mandibular left first molar	1.75	.75	1	1
Mandibular left lateral incisor	.5	0	.5	.25
Mandibular right first bicuspid	.75	0	.5	.75
Average Molars	1.5	.5	1	.875
Average Laterals	.75	.125	.625	.375
Average Bicuspids	.875	.375	.625	.875
Total score	1	.33	.75	.71

Table 8. Scoring for Silness-Loe Gingival Index in Oral-B toothbrush users.

The PASS plaque index score for each patient using an Oral-B is determined below:

Patient 1: $\frac{12}{20} = 60$ %. Patient 2: $\frac{16}{20} = 80$ %. Patient 3: $\frac{16}{20} = 80$ %. Patient 4: $\frac{18}{20} = 90$ %.

Results of the GI and PASS were averaged and are found in Table 7. When examining the patients in Group III it was interesting to observe that most of them had pink, firm, stippled gingiva and interproximal bleeding upon probing was minimal to none.

Second Part.

In the second part of this study two individuals were chosen to use automatic toothbrushes. One was given a Sonicare toothbrush and the other was given an Oral-B. They

were each examined and scored on four separate visits at three week intervals. Any changes in tissues were observed and noted. Tables were assembled for each patient showing their progress.

Patient A. This patient was given a Sonicare toothbrush. It was fantastic to see the positive change in the gingiva at each exam. Initially, bleeding upon probing was noted. The gingiva was smooth and pink with localized flaccidity. Throughout the study this patient had diminished bleeding upon probing. Although the gingiva remained pink, it became much firmer with stippling and the probe was met with sulcular resistance. Pictures were taken for comparison before and after using the Sonicare toothbrush. The before pictures are seen in Figures 1, 2 and 3.

Figure 1. Front view of Patient A first day.

Figure 2. Right view of Patient A first day.

Figure 3. Left view of Patient A first day.

The after pictures are seen in Figures 4, 5 and 6.

Figure 4. Front view of Patient A last day.   **Figure 5.** Right view of Patient A last day.

Figure 6. Left view of Patient A last day.

Upon final examination overall results for Patient A are seen in Table 9.

	First Visit	Second Visit	Third Visit	Fourth Visit
Gingival index	.875	.66	.375	.25
Plaque index	65%	75%	75%	80%

Table 9. Overall results for Patient A.

Table 9 clearly shows the progress made by Patient A during this nine week period. At the first

visit the patient's gingival index was .875 indicating mild gingival inflammation. This number

decreased at each subsequent visit to .66, .375 and .25 respectively. The plaque index also

improved from 65% at the first visit to 75% at the second and third visits and 80% at the final

visit. It is obvious from these plaque scores that the patient was below the acceptable 75% at the

first visit; indicating poor oral hygiene and an environment conducive to caries. These scores

increased to equal and then surpass the desired 75% signifying that the patient reached a good

oral hygiene level. The Silness-Loe GI was determined with the scores shown in Table 10.

	First Visit	Second Visit	Third Visit	Fourth Visit
Maxillary right first molar	1	1	.5	.5
Maxillary right lateral incisor	.75	.5	.25	0
Maxillary left second bicuspid	1	.5	.5	.5
Mandibular left first molar	1.5	1	.5	.5
Mandibular left lateral incisor	.5	.5	.25	0
Mandibular right first bicuspid	.5	.5	.25	0
Average Molars	1.25	1	.5	.5
Average Laterals	.625	.5	.25	0
Average Bicuspids	.75	.5	.375	.25
Total score	.875	.66	.375	.25

Table 10. Scoring for Silness-Loe Gingival Index of Patient A.

The PASS plaque index score for Patient A was calculated as follows:

First Visit: $\frac{13}{20} = 65$ %. Second Visit: $\frac{15}{20} = 75$ %.

Third Visit: $\frac{15}{20} = 75$ %. Fourth Visit $\frac{16}{20} = 80$ %.

Patient B. This patient was given an Oral-B toothbrush. Throughout the examinations

improvements in gingival tissue was incredible to witness. During the first exam, the patient had

minor bleeding upon probing around most of their teeth. The gingiva was soft and slightly

erythematous with some areas being flaccid. During the course of this study, bleeding upon

probing became less prevalent. Also, the gingiva appeared pink and firm and nicely stippled.

Pictures were taken for comparison before and after using the Oral-B toothbrush. The before

pictures are seen in Figures 7, 8 and 9.

Figure 7. Front view of Patient B first day.

Figure 8. Right view of Patient B first day.

Figure 9. Left view of Patient B first day.

The after pictures are seen in Figures 10, 11 and 12.

Figure 10. Front view of Patient B last day.

Figure 11. Right view of Patient B last day.

Figure 12. Left view of Patient B last day.

At the end of nine weeks the individual showed the results seen in Table 11.

	First Visit	Second Visit	Third Visit	Fourth Visit
Gingival score	1.5	.98	.86	.37
Plaque index	50%	65%	70%	75%

Table 11. Overall results of Patient B.

Table 11 shows the progress made by Patient B during a nine week period. At the first visit, the patient had a gingival index of 1.5 with moderate gingival inflammation. After three weeks of using the Oral-B toothbrush their GI lowered to .98. After six weeks their GI went down to .86 finally lowering to .37 at the end of nine weeks. Along with these scores, the plaque index also improved going from 50% at the first visit to 65% at the second and 70% at the third and final visit. The patient's initial PASS of 50% (below the acceptable 75%) demonstrated poor oral hygiene and a caries prone environment. At the last visit, the plaque index was 75% which signified that the patient was maintaining good oral hygiene. The Silness-Loe GI was determined using the scores shown in Table 12.

	First Visit	Second Visit	Third Visit	Fourth Visit
Maxillary right first molar	1.75	1	1.25	.5
Maxillary right lateral incisor	1.5	1	1	.5
Maxillary left second bicuspid	1.75	1.25	1	.75
Mandibular left first molar	1.5	1.25	1	.5
Mandibular left lateral incisor	1	.5	.5	0
Mandibular right first bicuspid	1.5	1	.5	.25
Average Molars	1.6	1.1	1.1	.5
Average Laterals	1.25	.75	.75	.25
Average Bicuspids	1.6	1.1	.75	.375
Total score	1.5	.98	.86	.37

Table 12. Scoring for Silness-Loe Gingival Index of Patient B.

The PASS plaque index score for Patient B was calculated each visit as follows:

First Visit: $\frac{10}{20} = 50\ \%$. Second Visit: $\frac{13}{20} = 65\ \%$.

Third Visit: $\frac{14}{20} = 70\ \%$. Fourth Visit $\frac{15}{20} = 75\ \%$.

Discussion

Oral hygiene improves with the use of electronic toothbrushes. This is clearly demonstrated when comparing the group of individuals using a manual toothbrush to the group using a Sonicare or Oral-B. The electronic toothbrush users have a plaque index above the acceptable 75% along with firm, pink stippled gum tissues. Their ability to maintain good oral hygiene makes them less prone to dental caries. Even though the gingival index was less than one, indicating mild gingival inflammation, for all patients in this part of the study; there is still a significant difference when comparing the GI between Group I and Group III. There is even a greater difference when comparing Group I and Group II, but some facts must be

considered. A person's gingival inflammation can be affected by other factors besides poor oral hygiene. These include smoking, diabetes, oral cancer, puberty, pregnancy, orthodontic treatment, malocclusion and dry mouth (Clocheret, Dekeyser, Carels, & Willems, 2003). Patients 3 and 4 in Group III confirmed that they suffer from malocclusion adding to the slight increase of gingival pocketing. Still, the plaque index of Patients 3 and 4 from Group III is greater than the individuals from Group I. This evidence of very little plaque at the neck of the teeth coincides with a healthier oral environment.

When observing the progress of the two patients who were given an electronic toothbrush in the second part of the study, it is easy to see the tremendous improvement in oral hygiene. During the nine weeks that both patients used their new Sonicare and Oral-B, gingival inflammation improved along with their plaque index. Neither patient received a prophylaxis during this study. They did not change their flossing habits or their toothpaste brand. The only enhancement to their oral hygiene routine was the addition of an electronic toothbrush. When observing the pictures of Patient A, there were only slight clinical differences since the gingiva was pink at the initial visit as well as the last visit. However, the pictures of Patient B show a significant change in the color of the gingiva which confirms that their oral hygiene improved. When asked about the overall experience, Patient A said:

*"Overall experience with the Sonicare toothbrush has been positive. Just after several days of use I feel that my oral hygiene has improved and feel more confident about my appearance. The toothbrush is easy to use and has several different settings, which includes a 'sensitive' mode that fits my needs well. The addition of the UV sanitizer makes me feel that my brushing experience is more sanitary and is a wonderful addition. The only negative that some people would ever experience would be the transition from manual brushing to using a Sonicare. Adjusting to the more intense sensation took several days, though now that use is habitual the brushing feels completely natural again. As long as proper instruction on the new style of brushing is given to the user, **I feel the Sonicare toothbrush is a great way to increase oral hygiene and should be used by everybody**."*

This statement concurs with the numbers to prove that the electronic toothbrush is a superior choice for improving oral health. The patient has a better feeling in their mouth which improves their self confidence.

When Patient B was asked about the overall experience he/she said:

*"When I first started to use the Oral-B it took some time to get used to. It would rattle my mouth and tickle. After a couple of days it did not bother me anymore and it actually felt normal. Once I started to get used to the toothbrush, I noticed an incredibly clean feeling. **My teeth feel very smooth, with no sensation of plaque being left**, especially on the back surface of the teeth. Now I cannot imagine brushing my teeth with anything different, **I want the clean sensation at all times**."*

This statement confirms even further that people will feel the difference after switching from a manual toothbrush to an electronic one. At the same time, the brush is actually improving their oral health, furthermore, their overall health; which is explained by the study done in Scotland in the years between 1995 and 2003.

Conclusion. Electronic toothbrushes are significantly more effective in removing plaque, therefore improve oral health. Striving for plaque free tooth surfaces will prevent gingivitis, periodontitis and even cardiovascular disease. Electronic toothbrushes are the perfect tool to assist in achieving this.

References

Abyss Design. (2009, March 21). *Electric toothbrush*. Retrieved from

http://users.forthnet.gr/ath/abyss/Electric-Toothbrushes.htm

Abyss Design. (2009, March 21). *History of the toothbrush*. Retrieved from

http://users.forthnet.gr/ath/abyss/History-of-the-Toothbrush.htm

American Dental Association. (2001, September). *Preventing periodontal disease*.

Retrieved from

http://www.ada.org/sections/scienceAndResearch/pdfs/patient08.pdf.

Biesbrock, A, Walters, P, Bartizek, R, Goyal, R, & Qaqish, J. (2008). American journal of

dentistry. *Plaque removal efficacy of an advanced rotation-oscillation*, *21*(3),

Retrieved from

http://www.dentalcare.com/media/enUS/research_db/pdf/Biesbrock_

AJD_06-2008.pdf

Clocheret, K, Dekeyser, C, Carels, C, & Willems, G. (2003). Idiopathic

gingival hyperplasia and orthodontic treatment: a case report. *Journal of Orthodontics*,

30(1), Retrieved from

http://jorthod.maneyjournals.org/cgi/content/full/30/1/13

Fogoros, R. (2011). *C-reactive protein and fibrinogen; newer risk factors for coronary artery

disease* . Retrieved from

http://heartdisease.about.com/library/weekly/aa110400a.htm

Wilkins, E.M. (2009). *Clinical practice of the dental hygienist*. Baltimore, MD: Lippincott

Williams & Wilkins.

Philips Sonicare. (2011). Retrieved from

http://www.sonicare.com/professional/dp/WhySonicare/Default.aspx

Pope, J. (1995). *Dental algorithms*. Retrieved from

http://www.rain.org/~landon/TeleDentAL/Dentistry%20and%20Oral%20Medicine.htm#Eastma

Thivierge, Bethany. *Oral Hygiene*. Health and Wellness Research Center. The Gale Cengage of Learning Encyclopedia of Medicine. University of South Florida Lib. 27 Sept 2010. http://galenet.galegroup.com.ezproxy.lib.usf.edu.

The Colgate Oral Care Report.(2010), 20(4). *Tooth brushing: is it related to inflammation and risk of cardiovascular disease?*. Retrieved from

https://secure.colgateprofessional.com/app/cop/repository/article-630/frameset.jsp?middle=issue_feature.html