

# Impact of Sonic Toothbrushing on Oral Hygiene Compliance of Patients



Case reports

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**PHILIPS**  
sonicare

# Introduction



**Petra Křížová**

Petra has been working in the dental field since 1987. She began her career as a general nurse, later she became a specialist dental nurse at the Department of Oral and Maxillofacial Surgery in Ústí nad Labem. In 1996 she began cooperating with Higher Vocational School of Health in Ústí nad Labem as a lecturer. Since 2010 she has been a supervisor of vocational training of dental hygienists at the 3rd Faculty of Medicine of the Charles University in Prague. She works as a dental hygienist in a private dental practice. During her studies she received training also in general nursing. She is an active lecturer and participant of various projects, such as Krokuz, Healthy teeth or Healthy smile for everyone.



**Kateřina Ciklová**

Kateřina graduated as a dental hygienist at the 3rd Faculty of Medicine of the Charles University in Prague in 2014. After her studies she joined the private dental practice Jablodent in Jablonec nad Nisou where she has been working until today. At Philips Oral HealthCare she has been working as Clinical Affairs Specialist. She helps spread knowledge about and experience with sonic power toothbrushes among dental professionals.

Power toothbrushes are often negatively perceived both by dental professionals and lay people. The negative attitudes may result from improper use of the products, inadequate brushing technique, longer brushing time than necessary, excessive brushing force and last, but not least, from the use of generic brand products of poor quality.

Still, in dental offices patients ask questions about power toothbrushes. There is a number of well-motivated patients, who are just unable to get better oral hygiene results using manual toothbrush due to a limited dexterity. On the other hand there are people highly interested in dental hygiene, who search for the best oral self-care products. Due to hectic modern lifestyle, many patients, even though interested in dental hygiene and with a regular dental attendance, do not have enough time and energy to maintain proper oral hygiene.

In compliance with general professional standards, dental professionals should get sufficient knowledge on power oral care to be able to explain to the patients all issues related to their use. They have sufficient knowledge on manual oral care, but their educational competencies are much broader. They should be able to instruct patients on proper brushing technique and optimal brushing time using a power brush. For instance, when using the power brush for the first time, the patient may experience some discomfort due to a high frequency of filament movement. The patient should be informed about this in advance and, if appropriate, asked to come for a follow-up check-up.

# How to Use Sonic Toothbrush Properly



## **Toothpaste application**

Apply a small amount of a toothpaste on the Philips Sonicare brush head. Use a toothpaste with low abrasiveness, gentle to your teeth and gums, non-foaming and without SLS.



## **Toothbrush positioning**

Place the toothbrush bristles against your teeth and gums, at a 45-degree angle towards your gumline. Apply only light pressure.



## **Tooth by tooth**

First, move the brush head slowly across the teeth, tooth by tooth. Next, guide the brush in a sweeping motion from gums to teeth. Let the toothbrush do all the work, brushing each surface of each tooth for at least 2 seconds.



## **Inner tooth surfaces**

Do not forget to brush the inner surfaces of upper and lower teeth in the same manner.



## **On inner surfaces of frontal teeth, place the toothbrush vertically.**

Brush the inner surfaces of the mandibular teeth thoroughly. Dental plaque left behind on those surfaces easily turns into dangerous tartar.



## **Occlusal surfaces**

Brush the occlusal surfaces by slowly moving the brush along each tooth.



## **Posterior teeth**

Be sure to brush also the last molars and their posterior surfaces.

**TIP:** For optimum results, prolong your brushing time, e.g. brush along the gumline for 2 minutes and sweep across the crowns and brush occlusal surfaces for another 2 minutes.

# Philips Sonicare - Case reports

Petra Křížová, 3rd Faculty of Medicine of the Charles University in Prague and Kateřina Ciklová, Philips Oral HealthCare.

## Aim

The aim of the study was to evaluate, whether the use of Philips Sonicare toothbrush in adolescents has a long-term positive effect on oral hygiene compliance compared to a manual toothbrush.

## Methods

A total of 14 healthy high-school students were included in the randomized study. To evaluate oral hygiene compliance, the following measures were used: plaque index score after the application of plaque disclosing agent, subject questionnaires and subject records from study visits. Clinical photographs were taken for the purpose of demonstration of individual clinical cases, not for oral hygiene evaluation. The eligible subjects were randomly assigned to 2 groups: 7 females were assigned to the sonic power brush group (hereinafter group S) and 5 females and 2 males were assigned to the manual toothbrush group (hereinafter group M). Originally, the study sample involved 18 subjects, but 2 females from Group M and 2 males from Group S stopped returning for study visits during the first weeks of the study and had to be excluded from the study. The study subjects were informed about duration of the study, taking of the clinical photographs and gave informed consent to participate together with their parents. The subjects were subsequently instructed about the proper brushing technique with the assigned toothbrushes. In the sonic brush group, the brushing technique involved brushing along the gumline for 2 minutes and sweeping across the crowns and brushing the occlusal surfaces for another 2 minutes. The sonic toothbrush used in the study was Philips Sonicare FlexCare Platinum with DiamondClean Mini brush head. In the manual brush group, the subjects were instructed to use the Bass technique and Tepe manual toothbrush. The subjects were informed that the minimum desired brushing time using manual brush is 5 minutes. The subjects underwent 6 study visits at the Training centre for dental hygienists of the Department of Dentistry of the 3rd Faculty of Medicine of the Charles University in Prague.

### Toothbrushing instruction

#### Manual toothbrush

Bass method



## Summary of study visits

Visit 1 – Week 1  
Visit 2 – Week 3  
Visit 3 – Month 2  
Visit 4 – Month 3  
Visit 5 – Month 5

During each study visit, plaque disclosing solution was applied on all tooth surfaces of every subject. Thereafter, clinical photographs of the teeth in occlusion with disclosed plaque biofilm were taken and areas with plaque accumulation were demonstrated. Subsequently, each subject was individually instructed about the proper plaque removal technique in inadequately brushed areas. The subjects were not asked to refrain from oral hygiene procedures before the study visits, nor were they forced to brush their teeth. The oral examinations were performed in the morning. During visits 4 and 5 the subjects' oral hygiene practices were evaluated using Quigley-Hein plaque index (QHI) score. The subjects filled out a questionnaire at study baseline and after the completion of the study and the experiences and perceptions of both subjects and evaluators were recorded after the study completion.

On Visit 2, the subjects were instructed to use the interdental cleaning device flosspic. On visit 3, the patients, in whom interdental brushes were more appropriate, were instructed to use individually sized interdental brushes. The subjects were advised to undergo professional dental hygiene.

#### Sonic toothbrush

Sulcular Brushing  
+ sweeping method



## Results

After Week 1 of the study (on Visit 2) there was a pronounced improvement in oral hygiene in Group M, while in Group S the anticipated improvement of oral hygiene was not observed. The study subjects in both groups were repeatedly individually instructed about the proper brushing technique. After Week 2 of the study (on Visit 3) a significant improvement was observed also in group S. During the subsequent study visits, the results in group S were sustained. On the other hand, the investigated oral hygiene parameters of individual subjects in group M were quite heterogeneous, and during the course

of the study the oral hygiene parameters in group M reached the scores observed at baseline. The tables below present the differences in QHI scores in individual study subjects including QHI mean and median values.

### Group M (Manual toothbrush)

	M1	M2	M3	M4	M5	M6	M7	Mean	Median
Month 2	1.85	1.26	1.25	1.27	0.87	-	-	1.3	1.26
Month 3	0.75	1.02	1.36	1.35	1.07	1.14	3.18	1.41	1.14
Month 5	1.21	1.86	1.95	1.57	0.66	2.24	2.33	1.69	1.86

### Group S (Sonic toothbrush)

	S1	S2	S3	S4	S5	S6	S7	Mean	Median
Month 2	0.29	0.37	0.49	-	0.14	0.75	-	0.41	0.37
Month 3	0.53	0.64	0.92	1.46	0.44	-	0.74	0.79	0.69
Month 5	0.72	1.47	0.8	0.78	0.37	0.5	0.8	0.78	0.78

## Conclusion

It was concluded that when using the sonic toothbrush the teeth are thoroughly clean in less time than when using the manual toothbrush. In the sonic brush group a significantly higher long-term compliance with oral hygiene practices was observed than in the manual toothbrush group. All study subjects from the sonic brush group considered using the sonic brush to be less time-demanding. Their compliance was enhanced by an overall pleasant feel in the mouth after the toothbrushing. On Visit 2 there was a pronounced improvement in oral hygiene in the manual brush group, while in the sonic brush group the anticipated improvement of oral hygiene was not observed. On Visit 3 the optimum results were observed in both groups.

The difference in the number of visits needed to reach noticeable results may be explained by differences between the two toothbrushes. A number of young individuals with normal dexterity can handle the manual brushing technique without any problems. Usually, in case of some minor shortcomings, it is sufficient to improve the brush positioning, brushing time or to demonstrate inadequately brushed areas.

However, when introducing a new oral hygiene device, the patient should be asked to come for a follow-up check-up to check the brushing technique. When starting to use sonic toothbrushes, the patients may encounter the itching, tickling or tingling feelings of the gums. The patients should be informed that this is normal and it is necessary to get used to the new brushing method. A combination of the above factors with the novel brushing technique may be so confusing to the patient that at home he does not adhere to the proper brushing technique. The solution is the follow-up check-up, during which a dentist or dental hygienist check the brushing technique. Shorter brushing time together with simplified brushing technique enhanced the compliance of the patients using sonic toothbrush to a long-term maintaining of adequate oral hygiene. On the contrary, during the course of the study, in subjects using the manual toothbrush, the toothbrushing compliance decreased, brushing technique was undesirably modified, brushing time shortened and oral hygiene worsened.

In order to present the study results, a classification of patients according to the attitudes to oral hygiene has been compiled. Representative cases both from S and M group have been chosen and the case reports are presented below. The case reports of moderately compliant patients represent the majority of the study subjects.

## Highly compliant patient

- Understands the need for oral health care.
- Fully understands the need for regular home oral self-care and is willing to allocate plenty of time for it.
- Fully understands the need for using individual oral hygiene devices which he/she uses regularly. From time to time, the frequency of the use of some oral hygiene devices may deviate from the recommendations of dental professionals.
- Fine dexterity enables the patient to perform the adequate brushing technique, which was demonstrated to him/ her.
- The patient is willing to continuously care for his/ her teeth, the need for encouragement and reassurance during the follow-up visits is minimal.

## Moderately compliant patient

- Understands the need for oral health care.
- Fully understands the need for regular home oral self-care, but may not be always willing to allocate sufficient amount of time for it.
- Understands the need for using individual oral hygiene devices, still he/ she is not willing to use all of them, or uses some of them irregularly.
- Fine dexterity enables the patient to perform the adequate brushing technique, which was demonstrated to him/ her. Still, when it comes to home self-care, he/she undesirably modifies the technique or stops using it in some areas.
- The patient is only moderately willing to continuously care for his/ her teeth, worsened oral hygiene may be observed during 6-month dental check-ups.
- The patient is determined to care for his/her teeth, but is not motivated enough to maintain optimum oral hygiene.

## Poorly compliant patient

- The patient does not understand the need for oral health care, which has very low priority for him/her.
- He/she may not necessarily understand the need for oral health care even after a thorough and repeated motivation sessions.
- He/she is not willing to allocate sufficient amount of time for adequate oral care.
- He/she does not understand the need for using different oral hygiene devices, and does not understand their health benefits.
- Inadequate fine motor skills may not enable the patient to perform the adequate brushing technique, which was demonstrated to him/ her.
- He/she is not willing to continuously care for his/ her teeth and no improvements are observed during 6-month dental check-ups.

## Highly compliant patient

Group M (Manual toothbrush)  
Patient's initials: A.R.

Group S (Sonic toothbrush)  
Patient's initials: S.P.

### Visit 1



At baseline, the oral hygiene of the patient is optimal, except for minor remnants of plaque along the gumline. After the application of plaque disclosing solution the colour of the plaque is light-pink, corresponding to immature biofilm. The patient brushes her teeth twice daily for 5 minutes and uses interdental brushes, but not on a daily basis.



In this patient, there is unsatisfactory plaque removal along the gumline, with a continuous band of plaque visible. In the lower jaw, after the application of plaque disclosing solution, there are areas of purple mature plaque. The lower teeth are crowded, therefore, consultation with an orthodontist was recommended. The patient brushes her teeth for approximately 2 minutes.

QHI: 0.87

### Month 2

QHI: 0.14



After 2 months of study duration, the difference between the two patients is significant. The QHI score is 0.87. She uses interdental brushes regularly, however, there is still plaque retention in particular at interdental sites.



In the patient, there is a significant improvement of oral hygiene. The plaque disclosing solution was applied twice during the same visit as no plaque was detected after the first application. After the application of the plaque disclosing solution, there was light-pink plaque observed on lingual surfaces of the teeth 46 and 47. The QHI score was 0.14. The patient uses interdental brushes regularly, and reports no problems with their insertion.

QHI: 0.66

### Month 5

QHI: 0.37



After 5 months of the study, the level of oral hygiene of the patient is stable. The colour of the disclosed plaque is light-pink (immature biofilm), on oral tooth surfaces there is a continuous thin band of mature plaque biofilm. After the application of plaque disclosing solution the QHI score is 0.66. The patient uses interdental brushes, but she admits that with a decreasing frequency. The patient reports to brush her teeth for 5 minutes.



After 5 months of the study, the plaque control in the patient is stable. There are minor areas of plaque, in particular on the vestibular surfaces of the second molars. The patient uses interdental brushes three times a week. The patient reports brushing time with sonic brush of 3 minutes, which is 1 minute longer than at the beginning of the study. The QHI score is 0.37.



## Moderately compliant patient

Group M (Manual toothbrush)  
Patient's initials: S.V.

Group S (Sonic toothbrush)  
Patient's initials: M.Č.

### Visit 1



After the application of plaque disclosing agent there was mature plaque biofilm detected along the gumline, in particular in the lower jaw. The patient was diagnosed with traumatic occlusion, therefore orthodontic consultation was recommended. The patient uses floss irregularly. In the questionnaire she reported the brushing time of 5 minutes 2-3 times a day.



There are significant shortcomings in the oral hygiene of the patient. Along the gumline there is a marked continuous band of dark purple, mature plaque. The patient reports brushing time of 2-3 minutes twice daily, she does not use any interdental cleaning devices. The examination reveals oedema and erythema of marginal gingiva. The patient reports bleeding during toothbrushing and complains of gingival pain.

### Week 1



During the 2nd visit there is a significant improvement of oral hygiene. Still, there are remnants of plaque left behind in particular in the lower jaw, on both vestibular and lingual tooth surfaces. High QHI score on tooth 34 that is orally inclined. The shortcomings were demonstrated to the patient and she was repeatedly instructed about proper oral hygiene technique.



After one week of toothbrushing with a sonic toothbrush there is an improved dental hygiene, but not as marked as anticipated. The clinical photograph shows that patient does not brush properly along the gumline despite the brushing technique instruction. She admitted that during the first visit she felt overloaded with information about the new cleaning device and experienced tickling feelings when she started using the device. This was so distracting that she did not keep the proper brushing technique at home. Thus, she was repeatedly instructed about the correct brushing technique.

### Week 2



Plaque retention tooth 34

After two weeks of using the Bass technique the oral hygiene of the patient is excellent, however, she is still unable to remove plaque from the inclined tooth 34.



After the repeated instructions the patient's teeth are perfectly brushed, with only small isolated areas of plaque at interdental sites. Gingival erythema, oedema and bleeding receded and the patient enjoys the clean feel in her mouth. She is still not using any interdental cleaning devices, therefore she was repeatedly motivated and the proper sizes of interdental brushes were selected again.

## Moderately compliant patient

Group M (Manual toothbrush)  
Patient's initials: S.V.

Group S (Sonic toothbrush)  
Patient's initials: M.Č.

### Month 2

QHI: 1.26



After 2 months the patient needs to be repeatedly instructed about the brushing technique. She is not using the recommended brushing technique and is not brushing properly. The QHI score is 1.26. There is plaque left behind in particular on vestibular surfaces of posterior teeth. There is plaque build-up on marginal gingiva. The patient finds it difficult to adhere to the proper brushing technique.

QHI: 0.29



After 2 months of the study, the level of oral hygiene of the patient is stable, plaque remnants can be detected only at interdental sites. The patient still refuses using interdental brushes. The QHI score is 0.29.

### Month 5

QHI: 1.86



Quadrant 4

The oral hygiene of the patient using the manual toothbrush has further worsened, as demonstrated by the QHI score of 1.86. The patient has difficulties with plaque removal on vestibular and oral tooth surfaces of the lower jaw along the gumline. There is also mature plaque on the marginal gingiva. The patient reports the brushing time of 3-4 minutes and she irregularly (twice weekly) uses interdental brushes.

QHI: 0.79



Quadrant 4

After 5 months of using the sonic toothbrush there are minor shortcomings in the plaque control, however, the level of oral hygiene is satisfactory on a long-term basis. The clinical photograph shows interdental sites with remnants of plaque and a thin band of dark pink plaque along the gumline on the vestibular tooth surfaces. The QHI score is 0.79. The patient is satisfied with the results and she acknowledges the need for recall examinations, as she is not able to maintain the proper brushing technique by herself on a long-term basis.

## Poorly compliant patient

Group M (Manual toothbrush)  
Patient's initials: K.K.

Group S (Sonic toothbrush)  
Patient's initials: N.D.

### Visit 1



At the study baseline there is a pronounced oral hygiene neglect in the patient. There are areas of mature plaque on the anterior teeth and in interdental spaces. More than two-thirds of oral tooth surfaces are covered with plaque. Dental caries was detected by visual examination on the vestibular surface of the tooth 22 and on the distal surface of the tooth 16. The tooth 45 is rotated. There is chronic gingivitis with marked gingival oedema. During the manual brushing technique instruction it is obvious that the patient's fine dexterity is limited. The patient does not report the brushing time.



During the baseline examination a pronounced oral hygiene neglect was observed. The crowns of the teeth 25 and 46 are destructed by dental caries. The patient has not visited dentist for 8 years, thus, she was referred to dental treatment. Nevertheless, during the course of the study, she did not seek dental treatment. There is plaque build-up in particular on posterior teeth, the tooth crowns are completely covered with plaque. The plaque is largely mature, dark blue. During the oral hygiene instruction session, the patient shows no interest in oral hygiene. She reports the assumed brushing time of 10 minutes.

### Week 3



During the third visit there is a pronounced improvement. The patient had to be repeatedly instructed about the brushing technique during the second and third study visit. Despite obvious plaque control, there is still gingival inflammation present, in particular in the upper jaw. There is gingival erythema on the anterior portion of the gingiva of the upper jaw.



Three weeks after the baseline visit there is a pronounced improvement, despite continuous plaque retention on the vestibular tooth surfaces of the 1st quadrant due to laterality. There are isolated areas of mature plaque along the gumline. The brushing technique is improving, the patient shows interest in oral hygiene. The patient was repeatedly instructed about the proper oral hygiene technique.

## Poorly compliant patient

Group M (Manual toothbrush)  
Patient's initials: K.K.

Group S (Sonic toothbrush)  
Patient's initials: N.D.

### Month 3

QHI: 3.18

QHI: 0.74



Quadrant 2,3



Quadrant 2, 3

The patient did not return for the 4th study visit for personal reasons. During the 5th study visit, 3 months after the study initiation, the oral hygiene level worsened. There is a pronounced plaque build-up along the gumline, the plaque covers more than two-thirds of the tooth crowns. There is gingival redness, oedema, bleeding and inflammatory exudate present. The QHI score is 3.18.

The patient did not return for the 4th study visit for personal reasons. During the 5th study visit, the oral hygiene level of the patient is optimal, as demonstrated by the QHI score of 0.74. There is still unsatisfactory plaque control on the right side vestibular tooth surfaces of both jaws. After repeated instructions of the proper brushing technique the patient has focused on those surfaces during the toothbrushing and the condition has been improving.

### Month 5

QHI: 2.33

QHI: 0.8



Quadrant 3



Quadrant 4

After 5 months of repeated instructions of manual brushing technique the patient's oral hygiene level is still unsatisfactory. As the patient learnt to brush all teeth more or less evenly, there is no longer a massive plaque build-up, but still the patient's self-care is inadequate. Along the gumline, in particular in the upper jaw, there is a continuous band of mature plaque biofilm. In the lower jaw the plaque control is more effective, even on lingual tooth surfaces. After the application of the plaque disclosing solution the plaque on the mandibular lingual surfaces is immature. The patient has not reported the brushing time. The QHI score is 2.33.

After 5 months of using the sonic toothbrush the plaque index scores are stable. During the final study visit the QHI score is 0.8. The gingiva shows no inflammatory changes except for distal teeth of the 1st and 4th quadrant. In the questionnaire the patient reports daily use of interdental brushes, which is not in conformity with clinical findings. During the whole course of the study, the patient did not seek dental treatment. The patient likes the overall better feel in her mouth and easier brushing technique. She has not reported the brushing time.