Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(2), 1219-1228 | ISSN:2251-6727

Title: Assessing the Efficacy of Manual Versus Powered Toothbrushes with Modified Bass Technique in Visually Impaired Children using Audio-Tactile Performance (Atp) Technique

Running Title: A Child Who Cannot See their Smile Should Still Have Every Opportunity to Maintain a Healthy One.

Dr. C. Chrishantha Joybell M. D. S [1 *]

[1] Reader, Department of Pedodontics and Preventive dentistry, Rajas Dental college and hospital, Tamil Nadu Dr.M.G.R Medical university

(Received: 16 January 2025 Revised: 20 February 2025 Accepted: 31 March 2025)

KEYWORDS

ATP technique, Dental plaque, Visually impaired, powered toothbrush, manual toothbrush

ABSTRACT:

Background: To compare the effectiveness of Manual and Powered tooth brushes using the Modified Bass method in visually impaired children using the Audio Tactile Performance (ATP) technique.

Settings and design: Eighty children, aged 4 to 15, with visual disabilities and residing in institution, were selected randomly.

Methods: Baseline plaque scores were recorded using Silness & Loe plaque index. The subjects were randomly allocated into two groups: 40 participants were provided with manual soft-bristled toothbrushes and trained in the Modified Bass technique, while the other 40 used powered toothbrushes with the same method, incorporating the ATP technique. Plaque scores were re-evaluated after a 2-month period. The effectiveness of oral hygiene maintenance in these children were analysed and evaluated statistically.

Statistical analysis: To compare mean values between groups independent samples t-test is applied. To compare mean values between two time points paired t-test is applied. To compare proportions between groups Chi-Square test is applied.

Results: The difference in the plaque score before and after health education was statistically significant with a p value of <0.001 showing that both powered tooth brush and manual toothbrushes when used for toothbrushing using the Modified Bass method of toothbrushing was very effective in plaque removal in visually impaired children.

Conclusion: The Modified Bass method of tooth brushing, when performed with both powered and manual toothbrushes, proved highly effective in improving the oral hygiene of visually impaired children when taught using the ATP technique, an effective communication tool.

INTRODUCTION:

Dental plaque is a sticky, colourless film of bacteria that forms on the teeth and gums. It plays a central role in the development of dental caries (tooth decay), gingivitis (inflammation of the gums), and the progression to periodontitis (advanced gum disease). The bacteria in dental plaque produce acids after we consume food particles, which can erode tooth enamel and lead to cavities. Additionally, plaque accumulation at the gumline can lead to gingivitis, characterized by red, swollen, and bleeding gums. If plaque is not regularly removed, it can harden into tartar or calculus, which further irritates the gums and can contribute to the progression of periodontal disease, ultimately affecting the supporting structures of the teeth, such as the bone.

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(2), 1219-1228 | ISSN:2251-6727

Therefore, regular removal of dento-gingival plaque through proper tooth brushing and flossing is essential to prevent the onset of these oral health issues and to maintain periodontal health. By effectively removing plaque, individuals can reduce the risk of developing caries and gum diseases, thus promoting overall oral hygiene and long-term dental health[1].

Mechanical cleaning methods, such as brushing and flossing, are widely recognized as effective tools in controlling supra-gingival plaque (plaque located above the gumline). Regular use of these techniques helps prevent the accumulation of plaque, which is essential for maintaining oral health. However, expecting individuals to consistently maintain a high standard of oral hygiene proves to be a difficult task for many people.

Despite the availability of various tools and techniques, adherence to proper oral hygiene practices often falls short due to factors such as lack of motivation, insufficient knowledge, physical limitations, or simply the complexity of performing the techniques correctly. For instance, some individuals may struggle to effectively clean hard-to-reach areas, particularly when they have limited dexterity, vision impairments, or other challenges that hinder their ability to perform thorough brushing or flossing.

This highlights the importance of supportive strategies—such as professional guidance, the use of specialized tools (e.g., powered toothbrushes or devices with audio-tactile feedback), and consistent reminders—to help individuals maintain an adequate level of oral hygiene. It is clear that, for many, a comprehensive approach that includes education, adaptive tools, and ongoing motivation is needed to achieve optimal oral care[2].

A number of factors have been suggested as playing a role in motivating the patients for performing effective oral hygiene procedures. Most important amongst these factors are patient's recognition of the oral problems and the awareness of various preventive oral hygiene measures[3].

The most important criteria to consider when working with special children is the need to emphasise the importance of preventive dental care [4]. Certain modifications to behaviour management approaches based on degree of disability, psychological development and social integration may facilitate the provision of dental treatment[5].

World Health Organisation in the year 1980 has defined handicapped person as "one who over an appreciable period is prevented by physical or mental conditions from full participation in the normal activities of their age groups including those of social, recreational, educational and vocational nature"[6].

From 2002 WHO survey, the estimated number of visually impaired children below the age of 15 yrs is almost 1.4 million. These children tend to have poorer oral hygiene than sighted children[7, 8]. The absence of visual stimuli prevents the child from rapid learning and thereby it poses a great challenge for the dentist in teaching them toothbrushing techniques[3].

Providing comprehensive dental care for the visually impaired children is not only rewarding but also a community service that dentists are obligated to fulfil in their career[9]. The normal typical techniques used to show the dental deposits cannot be used in these children[10].The visually impaired depend much more on noise, speech and touch to orient themselves to a situation[1].

Adaptation to new oral hygiene measures using manual tooth brush requires a medium of communication for these special children as the normal eye to eye level of contact cannot be established with them. As children in institutionalized schools are more readily accessible and already part of a structured learning environment, dental health education is most impactful in such settings. **(Zickert et al.,1982; Albandar et al., 1994; Morishita et al., 2003)[11,12,13].**

AIM & OBJECTIVE:

Visually impaired children struggle with acquiring basic life skills, and proper oral hygiene is one of the areas most affected [13]. They require a special health education method by which they could easily master the correct brushing technique. **'Audio tactile performance technique' (ATP),** a health education method that is specially designed, is a very effective communication tool to educate these children regarding oral hygiene maintenance.

Keeping this in mind, the present study was aimed to evaluate the effectiveness of Modified Bass method of toothbrushing using the ATP (Audio Tactile

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(2), 1219-1228 | ISSN:2251-6727

Performance) technique. The study also intended to compare the effectiveness of Manual Vs Powered toothbrushes in these visually impaired children using the Modified Bass method of tooth brushing.

MATERIALS & METHOD:

Eighty visually impaired children between ages 4-15 yrs were randomly selected from 'The School for the Blind' Palayamkottai, Tamil Nadu. The school provides education up to the 10th standard. Among the 80 children, 51 were males and 29 were female children; 41 were partially blind and 39 were totally blind. Verbal and written consent was obtained from the school authorities before the start of the study. Institutional ethical committee clearance was also obtained.

On the first day, there was an interactive session wherein, a good rapport was established with the children in a very friendlier atmosphere. The personal details of the children were recorded on a proforma which also included the details about their tooth brushing habits.

On the second day, the baseline plaque scores of the children were recorded for full mouth using The Silness and Loe plaque index[14]. This index is a commonly used tool to assess the amount of plaque present on a subject's teeth, providing a baseline measure for comparison after the intervention.

The children were examined at their school, two hours after breakfast, seated on an ordinary chair, under visible daylight using a pen torch, sterile mouth mirror and CPI probe. Protective cross infection control measures with disposable gloves and mask were all taken. The plaque score for full mouth was calculated. The children were categorised based on their oral hygiene status with their overall plaque scores as excellent, good, fair or poor.

On the third day, there was a verbal session where the importance of teeth and oral hygiene maintenance was explained to the children. A demonstration of the correct method of toothbrushing was given to the school teachers with a brushing model.

Tooth brushes with numbers on them and tooth pastes were given to the children.

The subjects were randomly divided into two groups, each consisting of 40 participants.

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(2), 1219-1228 | ISSN:2251-6727

1. **Group 1**: This group was provided with **manual soft-bristled toothbrushes**. Participants were trained in the **Modified Bass Technique**, which involves positioning the toothbrush at a 45-degree angle to the gum line and using short, gentle strokes to clean the gums and teeth.

2. **Group 2**: The second group was provided with **powered toothbrushes**, and like the first group, participants were trained in the **Modified Bass Technique**. This group also received guidance using the **Audio-Tactile Performance (ATP) technique** to enhance brushing accuracy.

The ATP technique incorporates three components namely, Audio, Tactile and Performance.

The children were first verbally informed about the importance of teeth and method of brushing. **(AUDIO)**

They were made to feel the teeth on a large sized model. **(TACTILE)**

The children were then taught to brush on the model with assistance. They were asked to feel their own teeth with their tongue and deposits if present was identified with the feeling of roughness. The children were taught to brush their own teeth with assistance. **(PERFORMANCE).**

This training continued until each child could brush his/ her own teeth independently with confidence, with the toothbrush that was given to them. The children were also taught about the amount of tooth paste to be used.

The teachers were asked to supervise the children daily during tooth brushing. They constantly motivated the children regarding the importance of oral hygiene and the correct method of tooth brushing.

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(2), 1219-1228 | ISSN:2251-6727

Two months later, a follow-up was conducted to record the plaque scores and assess the improvement in oral hygiene. The children were asked to recall their previous session and describe how they had brushed their teeth over the two months. They were also asked to demonstrate the technique on a model. The children's toothbrushes were examined to determine if they had been used. Flared bristles indicated that the assigned toothbrushes had been utilized. Additionally, the teachers at the residential blind school were questioned to verify if the children had been brushing correctly.

All the collected data was entered into Excel spreadsheets, and statistical analysis was performed using the Wilcoxon signed-rank test and paired t-test. The changes in plaque scores before and after the health education intervention were assessed. Statistical significance was determined to evaluate the effectiveness of ATP in training visually impaired children, and the comparison between manual and powered toothbrushing techniques was made.

RESULTS:

Among the 80 participants in the study, 51 were male and 29 were female. Of these, 39 were completely blind, while 41 had partial blindness.

The Normality tests Kolmogorov-Smirnov and Shapiro-Wilks tests results reveal that the variable (PI) follows Normal distribution. Therefore, to analyse the data Parametric methods are applied. To compare mean values between groups independent samples t-test is applied. To compare mean values between two time points paired t-test is applied. To compare proportions

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(2), 1219-1228 | ISSN:2251-6727

between groups Chi-Square test is applied, if any expected cell frequency is less than five then Fisher's exact test is used. To analyse the data SPSS (IBM SPSS Statistics for Windows, Version 26.0, Armonk, NY: IBM Corp. Released 2019) is used. Significance level is fixed as 5% (α = 0.05).

TABLE 1: Descriptive Statistics

		Type of toothbrush		
		Manual	Powered	Total
Age	N	39	41	80
	Mean	12.5	10.5	11.5
	Std Dev	1.65	3.03	2.63
	Median	13.0	10.0	12.0
	1st Quartile	11.0	8.0	10.0
	3rd Quartile	14.0	14.0	14.0

TABLE 2: Chi-Square test to compare proportions between Groups

		Type of toothbrush						p-value
		Manual		Powered		Total		
		N	%	N	%	N	%	
Gender	Male	27	69.2	24	58.5	51	63.7	0.320
	Female	12	30.8	17	41.5	29	36.3	
	Total	39	100.0	41	100.0	80	100.0	
Age group	<= 10 yrs	8	20.5	23	56.1	31	38.8	0.004
	11 - 13 yrs	14	35.9	6	14.6	20	25.0	
	>13 yrs	17	43.6	12	29.3	29	36.3	
	Total	39	100.0	41	100.0	80	100.0	

TABLE 3: Chi-Square test to compare proportions between Groups

		Type of toothbrush						p-value
		Manual		Powered		Total		
		N	%	N	%	N	%	
Reason for blindness	From birth	38	97.4	41	100.0	79	98.8	0.487*
	Accident	1	2.6	0	.0	1	1.3	
	Total	39	100.0	41	100.0	80	100.0	
Type of blindness	Partial	18	46.2	23	56.1	41	51.2	0.374
	Total	21	53.8	18	43.9	39	48.8	
	Total	39	100.0	41	100.0	80	100.0	
Method of toothbrushing	Horizontal	39	100.0	41	100.0	80	100.0	-
	Total	39	100.0	41	100.0	80	100.0	
Frequency of brushing	1	38	97.4	41	100.0	79	98.8	0.487*
	2	1	2.6	0	.0	1	1.3	
	Total	39	100.0	41	100.0	80	100.0	
Materials used	F/TP	1	2.6	0	.0	1	1.3	0.111*
	F/TPO	2	5.1	0	.0	2	2.5	
	TB/TP	36	92.3	41	100.0	77	96.3	
	Total	39	100.0	41	100.0	80	100.0	
Oral hygiene status	Poor	3	7.7	6	14.6	9	11.3	0.607*
	Fair	34	87.2	34	82.9	68	85.0	
	Good	2	5.1	1	2.4	3	3.8	
	Total	39	100.0	41	100.0	80	100.0	

* Fisher's exact test p-value

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(2), 1219-1228 | ISSN:2251-6727

TABLE 4: Independent samples T-Test to compare mean PI between groups

	Toothbrush type	N	Mean	Std. Dev	p-value
Baseline plaque index	Manual	39	1.47	.309	0.416
	Powered	41	1.53	.302	
Plaque Index measured after 2 months	Manual	39	.649	.127	<0.001
	Powered	41	.256	.147	

TABLE 5: Paired samples T-Test to compare mean PI between baseline and after 2 months of intervention

Type of toothbrush	Plaque index	N	Mean	Std Dev	p-value
Manual	Baseline	39	1.47	.309	<0.001
	after 2 months	39	.649	.127	
Powered	Baseline	41	1.53	.302	<0.001
	after 2 months	41	.256	.147	

The difference in the plaque score before and after health education was statistically significant with a p value of <0.001 showing that both powered tooth brush and manual toothbrushes when used for toothbrushing using the Modified Bass method of toothbrushing was very effective in plaque removal in visually impaired children. The ATP technique was effective in improving the oral hygiene of partially blind children.

DISCUSSION:

Visual impairment refers to the partial or total loss of vision, with severity varying from person to person. It can result from various factors such as illness, injury, congenital defects, or degenerative conditions. The most severe form of visual impairment cannot be corrected through conventional methods such as medication, corrective lenses, or surgery[15].

The extent of blindness varies and some individuals may retain partial vision, such as the ability to perceive light, colours, or shapes, and even read large print. Low vision differs from legal blindness and encompasses a broad range of conditions. Visual impairment can significantly impact daily tasks, including maintaining oral hygiene[15].

Visually impaired individuals deserve equal opportunities to maintain their oral health. Unfortunately, oral health care is often neglected among this special population. While they understand the functional importance of their teeth and mouth, the aesthetic aspects are generally of lesser concern **(Maciel et al., 2009)**[16].

Visually impaired children face significant challenges in learning daily skills, including proper oral hygiene. Research indicates that these children often have poorer oral hygiene compared to their sighted counterparts. Therefore, providing clear instructions on oral care is crucial[17,18].

Effective tooth brushing is essential for maintaining oral hygiene and reducing the burden of oral diseases in visually impaired children. However, motivating these children to adopt proper oral care is a significant challenge for pediatric dentists. Factors such as fear, limited experience, lack of time, and financial constraints often prevent adequate dental care.

Communication between dentists and visually impaired children is crucial for building rapport and trust.[15] Since conventional eye-level communication is not feasible, alternative teaching methods, such as the Audio-Tactile Performance (ATP) technique, have been recommended.

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(2), 1219-1228 | ISSN:2251-6727

In this study, visually impaired children in an institutionalized setting were taught proper tooth brushing using the ATP technique. Teachers were also trained and provided daily positive reinforcement to the children, emphasizing correct brushing techniques. The significance of positive reinforcement in oral health education has been highlighted by **Hebbal et al. (2012)[3]**, who unveiled that thorough training by health educators contributes to the success of oral health programs.

Prior to the study, only 10 children brushed their teeth twice daily. However, after the introduction of the ATP technique, 68 children adopted a twice-daily brushing routine. This improvement was supported by teachers, who provided motivation and reinforcement.

There was a significant improvement in the children's oral hygiene status, with most moving from poor or fair categories to the good category. Initially, only 3 children had good oral hygiene, but by the end of the program, 72 children had achieved good oral hygiene. Plaque scores showed a significant reduction, demonstrating the effectiveness of oral health education.

A similar study by **Hebbal et al. (2012)[3]** followed 96 visually impaired children aged 6-18 years over nine months and found that the ATP technique significantly increased brushing frequency and improved oral hygiene.

In this study, the Modified Bass technique was incorporated. The Modified Bass technique is effective for cleaning interproximal areas and the gingival third of the tooth surfaces **(Apiwan Smutkeeree et al., 2011)[19, 20]**.

The motivation and thorough training provided by school teachers contributed significantly to the success of the oral health program. The ATP technique was effective in teaching visually impaired children how to maintain good oral hygiene. These findings align with a study by **Yalcinkaya & Atalay (2006)[22]**, which assessed oral hygiene among 65 visually impaired students aged 7-17 years. Their study concluded that well-designed oral health programs could significantly improve oral health knowledge and status among visually impaired students.

Additionally, partially blind children demonstrated better mastery of tooth brushing compared to totally blind children, as indicated by a study conducted by **Krishna Kumar et al. (2013)[23]** involving 159 visually impaired children aged 5-17 years. Their findings suggest that partially blind children tend to have better oral health than their totally blind counterparts.

Sharma et al in 2012 from his study concluded that the use of a powered toothbrush helps to improve the effectiveness of plaque removal in people with visual disabilities which is in accordance with the current study[24].

The powered toothbrush removed plaque more effectively than the manual toothbrush over 15 days, consistent with studies conducted by **Breuer et al.,[25] Mayer,[26] and Niederman.[27]** This clinically significant result may be attributed to the acoustic microstreaming property of the powered toothbrush, which disrupts the attachment of biofilm-containing microorganisms that form plaque.[28] Based on these findings, this study was conducted to evaluate the 2 month plaque removal efficacy in visually impaired children.

LIMITATIONS OF THE STUDY:

Children at ages 4, 7, 12, and 15 differ in cognitive ability and manual dexterity, which affects their ability to perform tooth brushing effectively. Since tooth brushing requires fine motor skills, younger children need assistance. Additionally, motivation strategies vary by age, with older children having more developed cognitive abilities, which is a limitation of this study. Another limitation is the variation in the time each child spends brushing their teeth daily.

CONCLUSION:

The Modified Bass method of tooth brushing, when performed with both powered and manual toothbrushes, proved highly effective in improving the oral hygiene of visually impaired children when taught using the ATP technique, an effective communication tool. Powered toothbrushes demonstrated slightly superior plaque removal efficiency compared to manual toothbrushes. This study highlights that effective health education can significantly influence both brushing technique and frequency.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(2), 1219-1228 | ISSN:2251-6727

CONFLICTS OF INTEREST: The author has none to declare

FINANCIAL SUPPORT AND SPONSORSHIP Nil.

ACKNOWLEDGEMENT: I would like to acknowledge the authorities of the School for the Blind, Palyamkottai, Tamil Nadu, for their support and encouragement throughout my study.

REFERENCES:

[1] BhandaryS ,Shetty V, Hegde AM, Rai K. Knowledge of Care Providers Regarding the Oral Health of Visually Impaired Children. J Clin Pediatr Dent. 2013;37:385-9.

[2] Albandar JM and Rams TE. Global epidemiology of oral diseases: an overview. Perio 2000 2002; 29:7-10.

[3] M. Hebbal, A.V. Ankola. Development of a new technique (ATP) for training visually impaired children in oral hygiene maintenance. Eur Arch Paediatr Dent. 2012;13:244-7.

[4] Stephen H.Y.Wei. Pediatric Dentistry: Total patient care- Dentistry for special patients. . Philadelphia. 1988: 573-4

[5] Nandhi NS. New insights into improving the oral health of visually impaired children. J Indian Soc Pedod Prev Dent. 2003;21:142-3.

[6] M.S.Muthu, N.Sivakumar. Pediatric dentistry-Principles and Practise. Second edition 2011. 31:385.

[7] Vabitha Shetty, Amitha M Hegde, Srikala Bhandary, KavitaRai. Oral Health Status of the Visually Impaired Children – A South Indian Study. J Clin Pediatr Dent. 2010;34:213-6.

[8] Prashanth ST, Sudhanshu Bhatnagar, Usha Mohandas, Gopu H. Oral health knowledge, practise, oral hygiene status and dental caries prevalence among visually impaired children in Bangalore. J Indian Soc Pedod Prev Dent. 2011;29:102-5.

[9] Reddy KVKK, Sharma A. Prevalence of oral health status in visually impaired children. Journal of Indian Society of Pedodontics and Preventive Dentistry. J Indian Soc Pedod Prev Dent. 2011;29:25-7.

[10] Deborah RS, Moffett, Lieberman, Dummer GM. Perceived Competence of Children with Visual Impairments. J Vis Impair Blind 2005; 99:15-25.

[11] Zickert I, Emilson CG, Krasse B. Effect of caries preventive measures in children highly infected with the bacterium Streptococcus mutans. Arch Oral Biol 1982; 27:861-868.

[12] Albandar JM, Buischi YAP, Mayer MPA, Axelsson P. Long term effect of two preventive programs on the incidence of plaque and gingivitis in adolescents. J Periodontol 1994; 65:605-610.

[13] Morishita M, Sakemi M, Tsutsumi M, Gake S. Effectiveness of an oral health promotion programme at workplace. J Oral Rehabil 2003; 30:414-417.

[14] Soben peter. Indices in dental epidemiology. In: Essentials of preventive and community dentistry. 5th edtion. Chapter 18.;2013. Pg 422.

[15] PriyaVerma Gupta, Amitha Hegde. Visual impairments. In: Understanding and Management of special child in pediatric dentistry. First edition. 2012. Pgs 89- 94.

[16] Maciel MAS, Cordeiro PM, de Ávila S et al. Assessing the oral condition of visually impaired individuals attending the Paraiba Institute of the Blind. Revista Odonto Ciencia 2009; 24:354-360.

[17] Greelev CB, Goldstein PA, Forrester DJ. Oral manifestations in a group of blind students. ASDC J Dent Child 1976; 43:39–41.

[18] Anaise JZ. Periodontal disease and oral hygiene in a group of blind and sighted Israeli teenagers (14-17 years of age). Community Dent Oral Epidemiol. 1979;7:353-6.

[19] Apiwan Smutkeeree, Norawan Rojlakkanawong &Veeritta Yimcharoen. A 6-month comparison of tooth brushing efficacy between the horizontal Scrub and modified Bass methods in visually impaired students. Int J Paediatr Dent. 2011;21:278-83.

[20] M.Poyato-Ferrera, J J Segura-Egea, P Bullón-Fernandez. Comparison of modified Bass technique with normal tooth brushing practices for efficacy in supragingival plaque removal. Int J Dent Hyg. 2003;1:110-114

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(2), 1219-1228 | ISSN:2251-6727

[21] Harnacke D, Mitter S, Lehner M, Munzert J, Deinzer R. Improving oral hygiene skills by computer-based training: a randomized controlled comparison of the modified Bass and the Fones techniques. PLoS One. 2012;7(5).

[22] Yalcinkaya SE, Atalay T. Improvement of oral health knowledge in a group of visually impaired students. Oral Health Prev Dent. 2006;4(4):243-53.

[23] RVS. Krishna Kumar, Nusrath Fareed, Shanthi M. The Effectiveness of Oral Health Education Program with and without Involving Self-Maintainable Oral Hygiene Skills among the Visually Impaired Children. Int J of Scientific Study 2013;1:51-59.

[24] Sharma A, Arora R, Kenchappa M, et al. Clinical evaluation of the plaque removing ability of four different toothbrushes in visually impaired children. Oral Health Prev Dent. 2012;10(3):219–224.

[25] Breuer MM, Cosgrove R, Hardy D, et al. A comparison of the plaque-removal efficacies of two electric toothbrushes. Quintessence Int. 1989;20(7):501–504.

[26] Mayer R. Electric toothbrush manual toothbrush, a comparison test. ZWR. 1990;99(3):188–192.

[27] Niederman R. ADA Council on Scientific Affairs; ADA Division of Science; Journal of the American Dental Association Manual versus powered toothbrushes: the Cochrane review. J Am Dent Assoc. 2003;134(9):1240–1244. doi: 10.14219/jada.archive.2003.0359.

[28] McInnes C, Engel D, Martin RW. Fimbria damage and removal of adherent bacteria after exposure to acoustic energy. Oral Microbiol Immunol. 1993;8(5):277–282. doi: 10.1111/j.1399-302x.1993.tb00574.x.