

The Ability of Elderly to Clean Plaque on Full Denture Prosthesis Using Toothbrush with Special Grip Design

Burhanuddin Daeng Pasiga*

**Department of Dental Public Health. Faculty of Dentistry. Hasanuddin University. Makassar, Indonesia*

Corresponding Author: Burhanuddin Daeng Pasiga

ABSTRACT: Accumulation of plaque can also cause bad breath for denture users. In the elderly they do not have the ability to maintain oral hygiene and denture hygiene, including brushing after each denture. The inability to hold a toothbrush can affect the cleansing of the tooth prosthesis.

Objective: To determine the effect of using a special grip of toothbrush against a plaque reduction in the full dental prosthesis of the elderly.

Material and Method: The sample was a full dental prosthesis user, as many as 24 people and divided by 2 treatment groups: conventional toothbrush user group and toothbrush group with special grip made from clay material. Assessment of plaque on full dental prosthesis was performed before, after prosthesis brush and 7 days of use, using standardized denture hygiene index by Schubert.

Result: A decrease in the number of plaques occurred in each group after treatment. In the special grip toothbrush group, before the experiment on the first day, the plaque accumulation with score was 3.30 and after experimenting plaque accumulation 2.58 was decreased about 21.82%. While in the conventional group, before conducting plaque accumulation experiments that is 2.95 and after the experiment was 2.53 there was a decrease of about 14.24%. Plaque reduction between the first and seventh day for a special toothbrush was 16.12%, higher than that of conventional toothbrushes of only 7.2%.

Conclusion: the use of special toothbrush can help the elderly and the physical limitations to clean teeth or dental prosthesis

Keyword: tooth brush special grip, cleansing plaque, full denture prothesa

I. INTRODUCTION

Tooth loss is an individual dental origin of the socket caused by extraction due to caries or periodontal disease, trauma, and systemic disease. This loss of teeth usually occurs in the elderly and can lead to interference with the function of mastication, temporomandibular joint (TMJ), and psychological aesthetics and speech function^[1,2]. Replacement of missing teeth can be done with the manufacture of removable denture or fixed denture. Denture is used to replace missing teeth and restore the aesthetics and functional conditions of the patient.

Continuous and unsanitary Full Denture Users can increase plaque accumulation. According to Basker et al, the use of denture causes the mucosa under the denture to be covered for a long time, thus preventing the clearance of mucosal surfaces and denture by tongue and saliva. As a result on the surface of the denture will form plaque^[3]. Plaque is a good place for the growth of microorganisms.

Plaque formed on the surface of the removable denture may have an impact on oral and dental health. May cause inflammation of the soft tissues of the mouth, gingival inflammation and tooth decay. Accumulation of plaque can also cause bad breath for denture users^[4]. In the elderly they do not have the ability to maintain oral hygiene and denture hygiene, including brushing after each denture. While this is the key to the success of denture care, both fixed and release. For elderly patients who are weak and unable to hold a toothbrush, family involvement or nursing home staff is required to perform regular and professional dental brushing^[5].

The most commonly used method to remove denture plaque is to brush your teeth with toothpaste. If done correctly, this method efficiently eliminates plaque accumulation. However, to effectively remove plaques requires the level of manual abilities and visual acuity that are now often reduced, especially in the elderly^[6]. One of the systemic changes in the patient that may cause functional decline is Rheumatoid Arthritis (RA). One problem associated with RA is the lack of ability to perform regular oral cleansing; adapting the grip on the toothbrush to fit the patient's grip can do this. Frankel et al in their study, found a high level of reliance on relief in denture brushing because on average 82% of the samples were considered difficult or incapable of cleansing their dentures. It may be due to functional changes attached to the moment of aging



Figure 1. Denture hygiene index by Schubert (1979)⁸

As an alternative to cleansing of dentures from patients with poor motor skills, especially in cases of arthritis or after stroke, indicative adaptation of individual toothbrush hooks may be indicated. This tool can increase the volume of the handle and make it easier to brush the teeth, allowing the patient to use it, and can reduce the denture's plaque^[7]

Based on the above background, this study aims to compare the effectiveness of using a toothbrush with a handle that is individually adapted with a conventional toothbrush.

The assessment criterion in this study was manually calculating the amount of plaque on the full RA denture obtained from the immersion into the disclosing agent for 30 seconds. By using assessment criteria according to Schubert and Schubert

The presence of denture plaque was calculated using the method proposed by Schubert and Schubert. The researcher with the following criteria evaluates each part of the division in the image: 0 = no plaque; 1 = a little plaque; 2 = less than half covered plaque; 3 = more than half covered plaque; 4 = entire area covered by plaque. Each part of the denture is assessed by a defined criterion then each score of each part is summed and the amount divided by the total number of sections assessed 9 (Nine)^[8]

II. MATERIAL AND METHODS

This type of research is quasi experimental with pre and posttest with control group design. The sample of 18 people is the elderly group who use the full Denture Protesa Dentures. Each sample uses two types of toothbrushes to clean the full artificial teeth: (a) Conventional toothbrush: common toothbrush used by the general public. This toothbrush has soft brush feather, flat and has a straight brush handle. (b) Specific Toothbrush: a modified toothbrush modified by adding the volume of the toothbrush handle corresponding to the grip of each research sample. Research procedure. The research was conducted in several stages, namely: (1) Making of special handbrush, (2) Cleaning process of toothbrush, and assessment of cleaning result.

2.1 Making additional toothbrush handles

- a) Making additional handles on toothbrushes, researchers use clay-making materials.
- b) Prepare cornstarch, starch flour, rice flour, and white glue as much as 1: 1 each and mix.
- c) Add a little vegetable oil to the dough
- d) Stir the dough until the consistency is not sticky on the hand
- e) Enter on an airtight container. Clay dough is finished.
- f) Grab a handful of clay and cover the toothbrush handle
- g) Instruct the sample to hold the toothbrush that has been clayed to form the sample grip mold
- h) Let stand the toothbrush until clay hardens
- i) Color the clay with poster paint



Figure 2.Example of a toothbrush with a special handle

2.2 Preparation of a disclosing agent bath

- Prepare two immersion boxes with each filled with water. With one immersion box filled with disclosing 2 seeds.
- The denture removed from the sample mouth is washed in running water for 5 seconds and afterwards the denture is immersed into the discocculating water. Soaked for 30 seconds.
- Denture is judged according to the amount of disclosing attached to the sample gigitirun.
- All regions considered to be photographed.
- Samples are given toothbrush (group A: toothbrush special grip, group B: conventional toothbrush), then instructed to brush the dentures.
- The denture is then immersed in water berdisclosing for 30 seconds.
- Denture is revalued and photographed.
- Denture washed in running water and brushed clean.

This stage is done 3 times before, after the treatment and the seventh day.

Data analysis to know the difference of effectiveness of both treatment before, first and seventh day by using ANOVA. Analysis with significance level 5%. Data processing is by using SPSS version 20.0.

III. RESULT

The subjects of the study were elderly residing in the Army Dormitory who used the Full Dentures who were willing to be sampled in this study, as evidenced by the consent statement on informed consent. The target population in this study was 18 people who used full denture, with an affordable population of 12 elderly people. The subjects were chosen according to the criteria specified by the researcher. Six research subjects were excluded from this study because 3 people were smoking, and 3 were unwilling to do so because they were busy. The number of samples taken covers the entire population. The study subjects consisted of 10 women and 2 men, ages ranging from 62 years to 84 years, with an average age of 72 years.

Table 1 Comparison of the average number of plaque score (before, after)

Groups	Time			Sig*
	Before	After (1 day)	After (7 day)	
Special Handle tooth brush	3,30 ± 0,47	2,58 ± 0,622	16 ± 0,67	0,003
Convensionaltooh brush	2,95 ± 0,30	2,53 ± 0,27	2,35 ± 0,18	0,004

*Test Repeated Measured Anova , Significant if $p < 0,05$

Table 1 shows a decrease in the number of plaques occurring in each group after treatment. There were significant differences before and after treatment on the first day until the seventh day.

The average number of plaques that have been calculated in groups 1 (individual) and group 2 (conventional), at three time interval measurements can be seen in (Table 1-2).

Table 2 shows the comparison test results for each measurement in each group. There was a significant difference in plaque decrease before and after treatment for the first day. And there is a significant difference between before the treatment of the first day and after the treatment on the seventh day.

Table 3 shows the comparison of the mean difference of each group in each measurement. In the statistical test results showed no significant difference in plaque decrease between individual and conventional groups on the difference measurement after the treatment of the first day and after the treatment on the seventh day. This may be due to the lack of control of the subject at the time interval from day one to the seventh day. So on the results after the experiment on the first day to the seventh day decreased the amount of plaque accumulation was not significant compared before and after the first day.

Table 2. Post Hoc analysis

Group	Time	Before	Day 0	Day 7
Special Handle tooth brush	Before	-	0,062	0,004
	Day 1	0,062	-	0,059
	Day 7	0,004	0,059	-
Conventional tooth brush	Before	-	0,001	0,003
	Day 1	0,001	-	0,072
	Day 7	0,003	0,072	-

*Uji Post Hoc , $p < 0,05$

Table 3. Comparison of mean difference values between individual and conventional on each measurement

Time	Group	Difference	p value *
		Mean \pm sd	
Before – day 0	Special Handle tooth brush	0,72 \pm 0,21	0,007
	Conventional tooth brush	0,42 \pm 0,31	
Before – day 7	Special Handle tooth brush	1,13 \pm 0,41	0,019
	Conventional tooth brush	0,60 \pm 0,23	
Day1 – day 7	Special Handle tooth brush	0,42 \pm 0,32	0,129
	Conventional tooth brush	0,18 \pm 0,13	

*Uji t Independent, $p < 0,05$ (significant)

Figure 1 shows the mean values of plaque accumulation on the full denture measured on the first day before the experiment, after the experiment, and after 7 days of toothbrush use. A decrease in the number of plaques occurred in each group after treatment. In the individual group, before the experiment on the first day, the plaque accumulation was 3.30 and after experimenting plaque accumulation 2.58 was decreased about 21.82%. While in the conventional group, before conducting plaque accumulation experiments that is 2.95 and after the experiment was 2.53 there was a decrease of about 14.24%. Thus, the plaque decreases more in the individual group than in the conventional group.

Plaque reduction between the first and seventh day for a special toothbrush was 16.12%, higher than that of conventional toothbrushes of only 7.2%

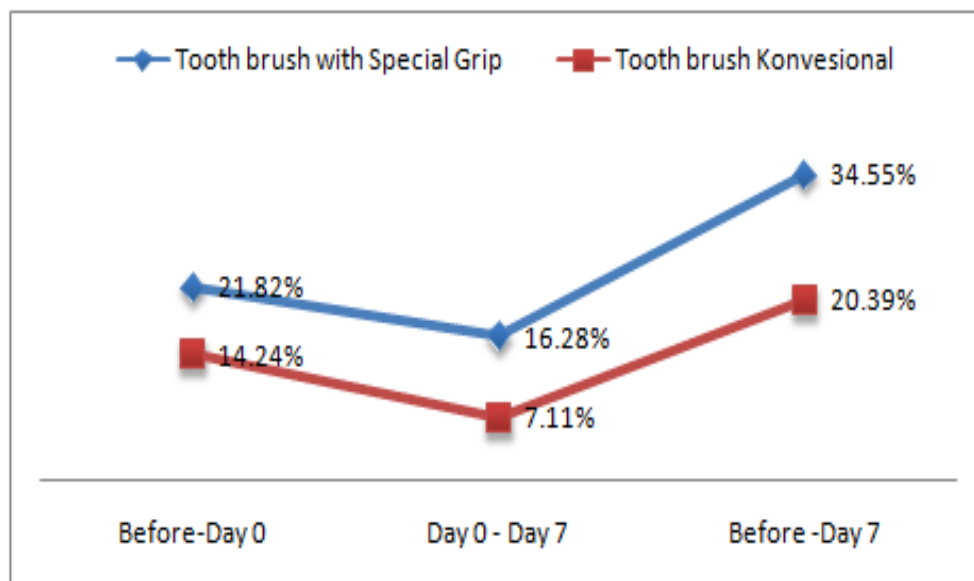


Fig3. The mean plaque values on the full denture were measured in each group at the time interval: Before the trial, after the first day (0 minutes), and the seventh

IV. DISCUSSION

The results of this study showed a decrease in plaque occurred in both groups. However, statistically significant reductions occurred in groups using handles. Thus, it strengthens the indications for the use of special toothbrush handles for the elderly to clean the dentures, and the ability to clean plaque on the internal surface of the upper denture base region is more effective.

The study conducted by Fernandes et al, 2 compares the effectiveness of three denture-specific toothbrushes (Bitufo-B, Medic Denture-MD, Colgate-C) in the removal of biofilms from upper and lower denture using a special toothpaste (CoregaBrite). The results of the study, states that all the toothbrushes used are effective in removing biofilms. There was no significant difference between denture-specific toothbrushes with a conventional toothbrush. This is similar to the results of a study showing a decrease in the number of plaques on the first day to the seventh day after using an individual toothbrush and conventional toothbrush. A full upper denture easier to clean than a lower denture may cause this decrease. Given that the lower denture has a large biofilm level especially on the internal part. Plaque decrease also occurs due to the brush of the toothbrush used, and the level of knowledge in cleansing the denture properly.

In the results of this study, Table 1 shows the mean values of plaque accumulation on the full denture measured on the first day before and after treatment, and on the 7th day after treatment. A decrease in the number of plaques occurred in each group after treatment. This reduction may be related to the influence of intervention and education on how to care for and clean the denture.

In table 3, measurement results after using individual toothbrush on the first day and the seventh day showed no significant difference. This may be because the study subjects were not controlled during the time span from day one to day 7 so it has not shown too much reduction in the amount of plaque accumulation.

In Kammers et al's study, ^[7] assessed the effectiveness of individually adapted toothbrush handles in reducing biofilms in the denture. Biofilms of the inner surface of the basal area of the denture will be observed using 5% erythrocyte. The images assessed before starting use a toothbrush, after 7 and 21 days. The results of the study, there was a significant decrease in biofilms in the individual toothbrush group, proving that the specially adapted toothbrush was effective in removing biofilms in the denture. This is similar to the results of the research; there is a decrease in plaque in both groups, namely the individual toothbrush group and the conventional toothbrush group. However, to effectively remove the biofilm requires the level of manual ability and visual acuity that is currently often reduced, especially in the parents. As an alternative to cleansing of dentures from patients with poor motor skills, especially in cases of arthritis or after stroke, indicative adaptation of individual toothbrush hinges may be indicated. This tool increases the volume of the handle and makes it easier to brush, allowing patients to use it, and consequently can reduce biofilms in figures.

The toothbrush handles adapted according to the sample grips in this study were made of clay. With consideration, easy to make, the cost is cheap and the manufacturing process does not require a long time. So, make it easy to make your own. In a study conducted by Kammers et al using the material from acrylic resin to increase the volume of the toothbrush holder. Although acrylic resins are low cost, but the processing time is long, and generally requires the help of a denture technician.^[7]

The toothbrush handles made according to the patient's grip are needed by patients with Rheumatoid Arthritis (RA). Patients with RA can also use electric toothbrushes, but if the patient's condition allows. Using a manual toothbrush with added grip on a toothbrush is better, with a smooth circular motion that can allow Arthritis patients to have good joints and muscle stimulation.^[6]

The key to good denture hygiene, as well as oral hygiene, is with good plaque control. There are several methods for denture hygiene that can be divided into mechanical methods and chemical methods. Mechanical methods are divided into manual and ultrasonic methods. Mechanical method is the method used to remove plaque and biofilm from the denture by using force.⁹ Brushing is the most widespread and advantageous method that is simple, cheap and effective. However, the denture with acrylic resin material will be mudak suffered damage to the coating material. Chemical methods can overcome some of these weaknesses. A chemical denture cleanser is able to remove food debris, biofilms, and tobacco stains from the denture's surface effectively. According to Gornitsky, chemical denture cleansers can be a good choice for patients, who require doctrinal actions to clear their dentures. This cleanser is calcified according to the composition and mechanism, ie hypochlorite, peroxide, enzyme, acid, simplicia and disinfectant.^[9,10]

Poor denture hygiene is often associated with lack of education, the characteristics of the denture, the limited ability of the elderly and the lack of specialized denture cleanser products on the market. Recommended toothbrush for denture wearers are two-sided toothbrush, toothbrush with uniform length of fur and soft bristle brush. Two-sided toothbrushes help to clear the plaque on the internal surface of the denture.^[2]

Further research is required by using samples with appropriate conditions given toothbrush with modified handle according to grip with the aim of seeing the effectiveness of the individual toothbrush. Considering the results obtained in this study in terms of reduction of plaque accumulation at the time after the first day to the seventh day, controls are required at the time before the experiment. With the aim that the results obtained are relevant and unbiased. The results obtained in this study in terms of reducing the amount of plaque accumulation in significant dentures are in groups using individual toothbrushes, it is desirable for dentists to understand that modified toothbrush handles according to the patient's grip can be recommended to the wider community, especially in elderly patients.

V. CONCLUSION

For elderly people who wear dentures full of decreased physical ability resulted in the ability to clean plaque on artificial teeth then needed a toothbrush with a special grip. It has been proven that the use of a special grip toothbrush can reduce the amount of plaque more than the use of conventional toothbrushes. Based on the results of this study then the use of a special toothbrush can be recommended for use by patients with special limitations or stroke patients

REFERENCES

- [1]. LengKongPingkan, PangemananDamajanti, Mariati Ni Wayan. GambaranPerilakuCara Merawat Gigi TiruanSebagianLepasanpadaLansia di PantiWerdaMinahasaInduk. *Jurnale-Gigi (eG)*; Vol 3 (1), Januari-Juni 2015.
- [2]. FernandesRoseana, Lovato Silva CH, Paranhos HD, Ito IY. Efficacy of Three Denture Brushes on Biofilm Removal From Complete Dentures. *Journal of Applied Oral Science*; 15 (1), 2007.
- [3]. Rahmayani Liana, Herwanda, Idawani Melisa. PerilakuPemakaigigitiruanterhadapmeliharaankebersihangigitiruanlepasan. *Jurnal PDGI*; Vol 62 (3), Sep-Des 2013, 83-84.
- [4]. Coulthwaite L, Verran J. Pottential Pathogenic Aspects of Denture Plaque. *British Journal of Biomedical Science*; 64 (4), 2007.
- [5]. Barnes Ian E. Perawatan Gigi TerpaduuntukLansia (*Gerodontology*), 2006.
- [6]. Alvares. Quality of life and Oral Hygiene in Older People with Manual Function Limitations. *Journal of Dental Education*. 2006.
- [7]. Kammers Ana CE, ZanettiArtemio L, LacerdaTaniae SP, ArocaJanaina P, CamilottiVeridiana, Mendonca MJ. Toothbrush Handles Individually Adapted for Use by Elderly Patients to Reduce Biofilm on Complete Dentures: Pilot Study. *Journal of Clinical Diagnostic Research*; Vol.9 (5), 2015.
- [8]. Guimaraes Magali, Pereira Duziene, Bueno Rodrigo S, Blaya Miceli B. Comparative Analysis of Different Chemical Methods
- [9]. Mylonas P, Afzal L, Atrill DC, Walmsley AD. Denture Hygiene: a Guide to the Delivery of Improved Denture Hygiene for our Patients. *Annual Clinical Journal of Dental Health*;2015. Hal 6-10.
- [10]. IngridMachano, Patricia C, Claudia H, Raphael F, Maria Cristina MS, Helena Freitas O.P. Effect of Chlorhexidine on Denture Biofilm Accumulation. *Journal of Prosthodontics*; 21. 2012, Hal. 2-6.

***Correspondence author: Burhanuddin Pasiga,**

Faculty of Dentistry. Hasanuddin University. Makassar-Indonesia , Email : bpasiga@gmail.com / bpasiga@unhas.ac.id