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Effect of Using Toothbrushes with Special Grips and Conventional Toothbrushes for Reducing Candida Albicans in Full Dentures Prosthesis for the Elderly

Burhanuddin Daeng Pasiga[1]
[1]*Department of Dental Public Health. Faculty of Dentistry. Hasanuddin University. Makassar.Indonesia*
**Corresponding author: Burhanuddin D. Pasiga.*

Abstract: *Candida Albican colony buildup on the surface of dentures due to the inability to clean it, especially for elderly users. The inability to hold a toothbrush can affect the cleaning of dental prostheses.*
Objective: *To determine the effect of using a special toothbrush handle to reduce the number of colonies of Candida Albicans on the surface of full dentures.*
Materials and Methods*: The samples were complete dental prosthesis users, 24 people and divided into 2 treatment groups namely conventional toothbrush group users and toothbrush groups with special grips made of clay material. Assessment of the number of colonies in full dental prosthesis was carried out before, after the prosthetic brush and 7 days of use. To determine the number of Candida: a candida colony extracted from the swab on the base of the maxilla full denture, then cultured on subouraud dextrose for medium (SDA) with CFU (Colony Forming Unit).*
Result*: There is a difference in the number of albican candida colonies before and after brushing with a toothbrush with special grips (p <0.05). The use of conventional toothbrushes has no significant difference. The percentage reduction in the number of colonies on the seventh day for the use of toothbrushes with a special handle of 67%, is greater than the reduction in the candida albicans colonies of conventional toothbrush users by 42.18%.*
Conclusion*: The use of toothbrushes with special grip can help the elderly to clean their teeth or dentures.*
Keywords: *toothbrush special grip, Candida Albicans, Full denture prosthesis*

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I. Introduction

Artificial dentures and edentulous mucosal tissue are important to overall health, especially in the elderly[1]. If the denture is not properly cleaned it can cause fungal and bacterial infections in the oral cavity, and consequently pain and cracking at the corners of the mouth, the incidence of bad breath, which ultimately affects overall general health[2]

The fungal organism most often associated with denture plaque is from the Candida genus[3]. Most of this yeast is present in the saliva of denture users and shows its relationship to its adhesion to the methacrylate resin[2]. This yeast is very effective in filling a basin formed by the junction of a monomer bubble with a polished surface of an acrylic resin, which is difficult to remove[4].In denture users, Candida albicans attaches to the surface of the tissue in contact with the base of the maxillary denture, which serves as an effective reservoir of microorganisms[5–7].Lesions of the oral mucosa associated with removal of dental plaque microbial on the denture[7]. Lesions are heterogeneous groups associated with pathogenesis. They include denture stomatitis, angular cheilitis, traumatic ulcers, denture irritation hyperplasia, and oral carcinoma[6].Common oral microflora such as Candida albicans and Streptococcus mutans are found attached to the surface of denture acrylic and to the mucosa[6]

Denture cleansing can be done mechanically and chemically. Among the mechanical methods, brushing is believed to be the most effective way to clean the denture because it is so easy, reliable and cheap[4,6]. However, cleansing with brushing requires physical ability, which is difficult for disabled and elderly people with less motor skills. Properly designed brush designs are essential in both handling and removal of organic and inorganic residues and stains from denture surfaces. Dental health professionals should have sufficient knowledge about denture cleansing strategies to maximize the services offered to their denture patients[8]. The attractive denture brush is designed with a special handle by increasing the volume of the toothbrush holder allowing the elderly to use it in an effort to keep the denture cleaner used[5,9].

II. Material And Methods

This type of research is quasi-experimental with pre and post-test with control group design. The sample of 18 people is the elderly group who use the full Denture Protesa Dentures. Each Conventional toothbrush: common toothbrush used by the general public. This toothbrush has soft brush feather, flat and has a straight brush handle. (2) Individual toothbrush: modified toothbrush holder corresponding to the grip of each sample of the study.The construction of a special toothbrush handles in accordance with the method made by Pasiga BD[5] To determine the number of Candida: a candida colony extracted from the swab on the base of the maxilla full denture, then cultured on subouraud dextrose for medium (SDA) with CFU (Colony Forming Unit). The measurement process the amount of Candida Albicans colonies performed 3 times the measurement before cleaning, after cleaning and on the seventh day.

a) The denture that has been removed from the sample by a cotton swab on the palate part of the denture in contact with the mucosa
b) Insert the cotton swab into a tube containing NaCl
c) Bottles are marked using name labels
d) Samples were given toothbrush (group A: individual toothbrush, group B: conventional toothbrush), then instructed to brush the dentures
e) After the brushing process of the ductile part of the gothic tooth with the mucosa removed by cotton swab is then fed to a tube containing NaCl then labeled
f) The NaCl tube was taken to the Microbiology Laboratory of the Faculty of Medicine Unhas to measure Candida colonies
g) The sample is instructed to brush the dentures
h) The denture that has been removed from the sample mouth is removed by using a cotton swab on the part of the denture palate that is in contact with the mucosa
i) Insert the cotton swab into a tube containing NaCl
j) Bottles are marked with name labels
k) The NaCl tube was taken to the Microbiology Laboratory of the Faculty of Medicine Unhas to measure the candida colony

All data is processed using SPSS 20.0 for Windows (SPSS Inc., Chicago, IL, USA). Statistical test used was ANOVA repeated measures, post hoc test and independent t test. Data are presented in tables and diagrams.

III. Result

The study sample of 18 elderly subjects consisted of 12 women and 6 men, ages ranging from 62 years to 84 years old, with an average age of 72 years. The average difference and standard deviation on the 3 measurements (before treatment, after treatment, and after the seventh day) in each group can be seen in table 1 below.

Table 1 Comparative analysis of Candida colonies ((Colony Forming Unit) before and after treatment of the first day and after the seventh day in each group

Group	Time of assesment			p value*
	Before	Day-1	Day-7	
Individual toothbrush (Special Grip)	51.50 ± 32.54	38.67 ± 24.68	17.00 ± 16.78	0.037
Conventional toothbrush	42.67 ± 26.33	33.50 ± 18.93	24.67 ± 13.32	0.123

*Analysis with ANOVA Test → significant if $p<0.05$

Repeated ANOVA test results in table 1 obtained significance value $p = 0.037$, which means there is a significant difference on the use of individual toothbrushes in lowering the number of Candida colonies in three measurements. In the group using conventional toothbrushes obtained significance value $p = 0.123$ which means there is no significant difference in the use of conventional toothbrush in lowering the number of Candida colonies in three measurements. Further analysis using post hoc shows a significance value of $p = 0.037$ which means that there is a significant difference between before and after using an individual toothbrush on the first day. In the measurements before the treatment on the first day and the seventh day showed no significant difference ($p = 0.098$), as well as the measurements after treatment on the first day and the seventh day with the significance value $p = 0.161$.

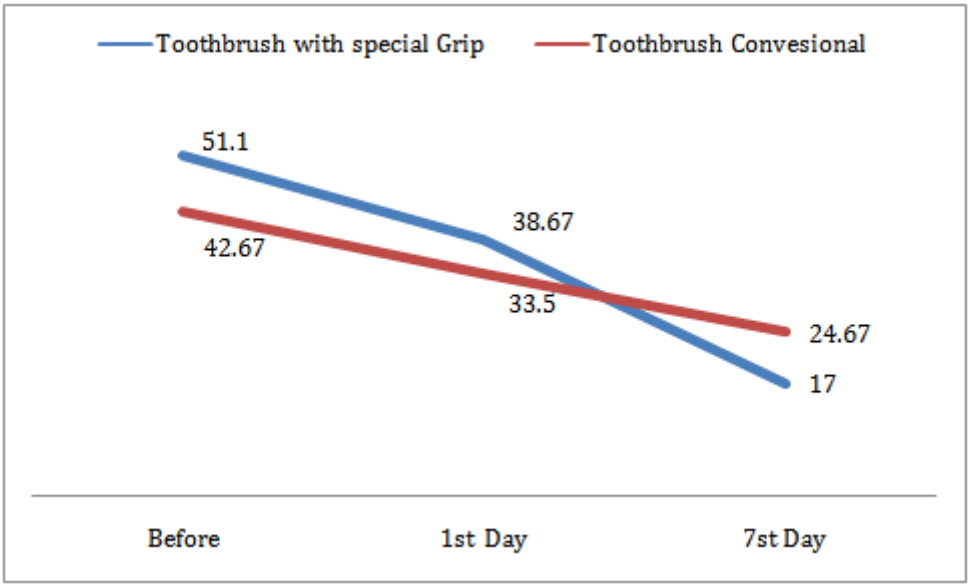

Figure 2. The average value of the number of Candida colonies in the full denture measured in each group at the time interval: before treatment, after treatment on the first day, and after 7 days.

Figure 2 shows the mean values of the number of Candida colonies on the full denture measured on the first day before treatment, after treatment, and after 7 days of toothbrush use. In the group using individual toothbrushes, before experimenting the number of Candida colonies as much as 51.5 CFU and after experimenting on the seventh day the number of Candida colonies as much as 17 CFU which means a decrease of about 34.50 or about 67%. While in the group using a conventional toothbrush, before experimenting the number of Candida colonies as much as 51.5 CFU and after experimenting on the seventh day the number of Candida colonies as much as 42.67 CFU, which means a decrease of about 18 or about 42.18%. The decrease in the number of Candida colonies occurs most in groups that use individual toothbrushes.

IV. Discussion

One of the limitations suffered in patients with chronic diseases such as arthritis, for example, has difficulty holding objects, which can interfere with cleansing of the denture.7 The purpose of this study was to determine the comparative effectiveness of the use of individual toothbrushes and conventional to decreased amounts of Candida in elderly dentures.

Hygiene controls on full dentures have long been advocated as an important element in maintaining the health of mucosal tissues and denture surfaces themselves. Poor hygiene controls on the denture have been reported as a major problem in denture wearers causing plaque accumulation on the surface of denture, bacteria and fungi, halitosis, strokes caused by stomatitis and gastrointestinal complications[7]. Denture cleansing can be done mechanically and chemically. Among the mechanical methods, brushing is believed to be the most effective way to clean the denture because it is so easy, reliable and cheap[1011]. The use of loose dentures and poor oral hygiene are the most common causes of this opportunistic infection, there is a buildup of Candida Albicans[11]

Although there is a special toothbrush to clean the denture, but the handle of this particular toothbrush has not been modified to meet the needs of patients who have less motor skills especially in the elderly. In this study, using conventional toothbrushes, cheap, and easily reachable by most residents, making it possible to change the toothbrush used. Individual toothbrush in question is a toothbrush with the volume of the handle added in accordance with the grip of each subject in the experimental group[12].

Research conducted by Kammers et al regarding the use of individual toothbrushes in elderly to reduce biofilms in full denture suggests that significant reductions in biofilms in groups using individual toothbrushes. In a study conducted by Kammers et al using materials from acrylic resins for increase the volume of the toothbrush holder[9]. Although acrylic resins are low cost, but the processing time is long, and generally requires the help of a denture technician. Therefore, in this study in accordance with the Pasiga BD[5] study-using clay made from flour, considering the material is affordable, easy to make itself, the cost is economical, and the process is fast. The results showed that there were significant differences in the groups using individual toothbrushes in reducing the number of Candida colonies, while in the group using conventional toothbrushes there was no significant difference in decreasing the amount of Candida colony. This proves that groups using

individual toothbrushes are more effective at lowering the number of Candida colonies compared with those using conventional toothbrushes. A decrease in the number of Candida colonies may be due to the increased volume of toothbrushes allowing the elderly in improving their motor skills in cleansing the denture.

In groups using individual toothbrushes showed that there was a significant difference between before and after using an individual toothbrush on the first day. This is because prior to brushing using individual toothbrushes, it is likely that the research subjects used their dentures during activity so that there were many colonies of Candida, whereas when the subjects brushed their teeth with individual toothbrushes there was a significant decrease in Candida. This reduction may be related to the influence of intervention, monitoring, and education on how to care for and clean the denture. The same study also conducted by Pellizaro et al showed that a 96% reduction in the amount of Candida colonies after brushing with water because there is a mechanical action of direct contact between the bristle brush and the accumulation of biofilms and the hydrodynamic forces of the water flow during brushing. Under these conditions, the biofilm is mechanically disturbed from the surface of the acrylic resin[10].

When compared between the measurements after using an individual toothbrush on the first day and the seventh day showed that there was no significant difference. This may be because the study subjects were not controlled for the duration of the first day to the seventh day so it has not shown too much reduction in the number of Candida and the subjects are also not too used to using a toothbrush whose volume of handles is added in cleansing the dentures in just 7 days.

The results of the study showed that there was Candida in all-maxillary jaws. The base material of the denture used by all subjects is made of acrylic resin, which in earlier in vitro studies illustrates that Candida albicans (C.albicans) is readily attached to various resins, glass, and metal surfaces. Denture base of the denture Rough surfaces may affect Candida's adhesion to acrylic resins. C.albicans's ability to adhere to polymer surfaces has been attributed to hydrophobic and electrostatic forces. The surface resin characteristics resulting from the chemical process result in the initial adhesion of Candida to the denture resin and provide an opportunity for binding and colonizing[2,10]. Some other factors may affect the adhesion of the yeast strain to the acrylic resin. Previous research has shown that saliva and denture pelvis can encourage C.albicans adhesion to acrylic resins and glycoproteins on the yeast surface may be involved in this attachment. In addition, layers of parotid saliva are significantly increased C.albicans bonding in acrylic denture compared with submandibular and sublingual saliva. Most likely, the attachment of C. albicans to denture surfaces is mediated by specific salivary components. In Candida colonies in full denture in groups using individual toothbrushes, it is expected that dentists to understand that modified toothbrush holder can be recommended to the general public, especially in elderly patients. In addition to allowing for more efficient lowering of Candida and biofilms from the dentures, it can also enable them to improve the quality of life especially in patients who have difficulty in grasping.

V. Conclusion

The decrease in the number of Candida colonies was greater in the group using toothbrushes with modified handles according to the patient's grip compared to the group using conventional toothbrushes. The use of toothbrushes with special grip can help the elderly to clean their teeth or dentures.

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Declaration of Interest

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