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Comparison of the Effectiveness of U-Shape Toothbrushes and Conventional Toothbrushes for Cleaning Dental Plaque: A Narrative Review

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ABSTRACT

Introduction: Tooth brushing is an act of dental and oral health care that is most performed by the community. The function of brushing teeth is to control plaque so as not to cause dental and oral diseases, namely caries and gingivitis. People often do practical things, namely by using an electric toothbrush, where the toothbrush is not yet known how effective it is in removing dental plaque. Purpose: to find out the differences in the effectiveness of U-Shape electric toothbrushes and conventional toothbrushes in cleaning dental plaque. Methods: This literature study uses the narrative review method. Journals and references were collected through the BMC Oral Health, PubMed and Google Scholar online databases and websites which were selected selectively and in accordance with this literature study. Conclusion: The use of a U-Shaped toothbrush shows results that are not effective in removing plaque and is equivalent to not brushing your teeth at all and brushing your teeth using a conventional toothbrush is also still better at removing plaque

INTRODUCTION

Oral hygiene is something that must be considered, because it can have an impact on the health of the oral cavity. If oral hygiene is poor, dental plaque can accumulate and cause oral diseases. Dental plaque is a microbial biofilm that can be found on the tooth surface. Dental plaque accompanied by excessive consumption of sugar can lead to the formation of dental caries and periodontal disease. Based on Basic Health Research (RISKESDAS) in 2018, the prevalence of caries in Indonesia is 88.8% with the correct proportion of teeth brushing time of 2.8%. The prevalence of periodontitis in people aged ≥ 15 years according to 2018 RISKESDAS data is 67.8%, this means that out of ten Indonesian residents, 7 people suffer from periodontitis. Efforts are being made to avoid the accumulation of dental plaque to avoid periodontal disease in the future, several things can be done, namely brushing your teeth twice a day, using mouthwash, and using dental floss. Most people brush their teeth using a conventional toothbrush.

Over time, knowledge, and technology in the field of dentistry continues to grow. Currently there are several types of toothbrushes, one of which is an electric toothbrush. An electric toothbrush is a toothbrush that automatically emits vibrations, making it easier to use. One of the most talked about electric toothbrushes is the U-Shaped toothbrush. Many articles claim that U-Shaped toothbrushes are better at cleaning dental plaque and debris than conventional toothbrushes. However, several research journals say that using a U-shaped toothbrush is no better than a conventional toothbrush. This writing aims to determine the effectiveness of U-Shaped toothbrushes in reducing the amount of dental plaque.

METHODS

This literature study uses the narrative review method. Journals and references were collected through the BMC Oral Health, PubMed and Google Scholar online databases and websites. References are also selected based on journal titles, keywords, abstracts, and journal content that are in accordance with the material from this literature study. Dental Plaque

RESULTS AND DISCUSSION

1. Dental Plaque

Dental plaque is a soft granular deposit that is generally firmly attached to the tooth surface. Plaque can also adhere to other rough surfaces in the oral cavity, such as dentures, restorations, orthodontic devices, and so on. Plaque bacteria proliferate in an intercellular matrix and contain the proliferating microorganisms along with small numbers of epithelial cells, leukocytes, and macrophages.

Dental plaque is a yellow-gray elastic clear deposit that is difficult to remove by simply rinsing but can be removed mechanically by brushing your teeth. Dental plaque is different from alba and calculus. White matter is an accumulation of food residue and is easily removed by simply rinsing. The alba matter usually looks like a fine, white deposit. Calculus is calcified plaque, which usually looks like a hard deposit that is difficult to remove by brushing your teeth.

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2. Conventional Tootbrush

A conventional toothbrush is an instrument that is generally used to remove plaque from teeth. The conventional toothbrush design consists of heads, bristles, and handles that have various shapes. However, the most common design is a rectangular brush head and a flat bristle pattern.13–15 The ideal property of a toothbrush is that it should be easy to use, be able to remove plaque effectively, and have no damaging effect on soft or hard tissues.

Conventional toothbrushes can remove dirt and food residue so that they can prevent dental and oral

diseases. Brushing your teeth using a conventional toothbrush can clean your mouth from food residue so that the fermentation of leftovers does not last long, so that tooth decay can be avoided.

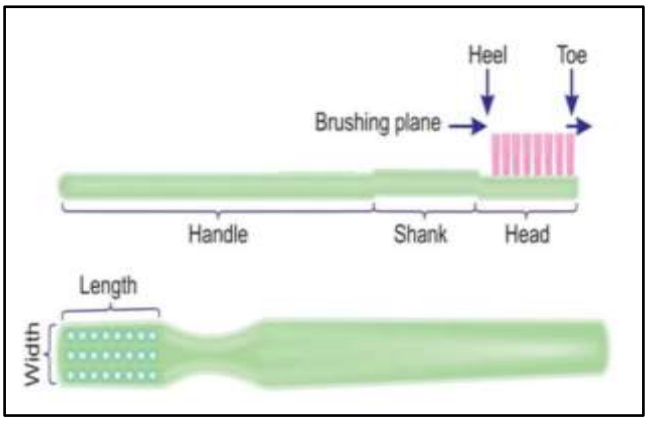

Figure 1. Parts of a Conventional Toothbrush

3. U-Shape Toothbrush

The U-Shaped toothbrush belongs to the electric toothbrush type which means that the bristles on the toothbrush move by themselves, using a back-and-forth, rotating or swaying motion. The U-Shaped toothbrush is an electric hoof-shaped toothbrush with silicone bristles. The purpose of this U-Shaped toothbrush innovation is to facilitate individuals who have poor hand skills, impaired motor function, or do not have the motivation to clean their teeth and mouth. From the manufacturer's description, the bristles are shaped at a 45 degree angle to the marginal gingiva to simulate the Bass method of brushing technique.

The shape of the U-Shaped toothbrush adapts to the shape of the jaw arch, making it easier to use. The tool must be connected to a rechargeable handpiece that has a place for toothpaste, when pressed the button will dispense the toothpaste needed for one brushing.

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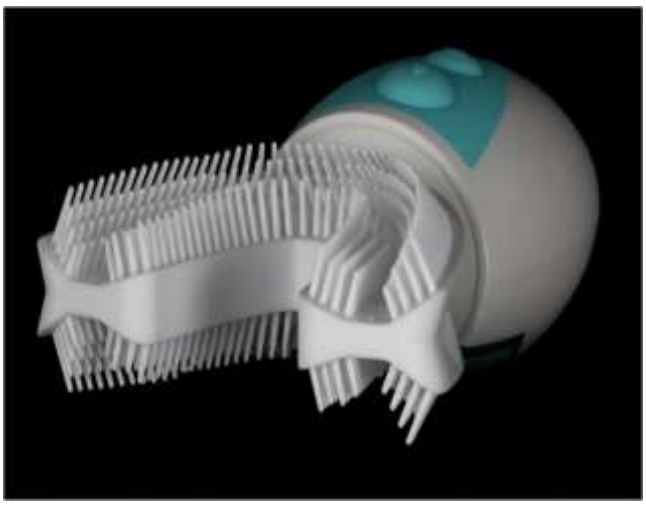

Figure 2. U-Shaped Electric Toothbrush

Figure 3. How a U-Shaped Toothbrush Works

4. Comparison of U-Shape Toothbrush and Conventional Toothbrush

The U-Shaped toothbrush is an electric toothbrush that has silicone bristles, which can automatically clean the upper and lower jaws simultaneously, while conventional toothbrushes have different types of bristles, namely soft, medium or coarse. The U-Shaped toothbrush has two separate parts, namely the intra-oral part and the extra-oral part. The extra oral section contains two rails that accommodate two Y-shaped electromagnetic fields that move to create a magnetic field to control the ball producing horizontal and vertical movements to reach the tooth surface in the oral cavity to perform brushing action.

When brushing your teeth, when following the recommendations for brushing your teeth for at least 2 minutes, the average person brushing each tooth is 4 seconds. In brushing using a conventional toothbrush, it is done one tooth at a time, while the U-shaped toothbrush has covered both dental arches and has been directed to clean all tooth surfaces simultaneously.

In a U-shaped toothbrush, the outermost arrangement of the bristles is away from the tooth surface or can touch the palatal gingiva, and the bristles may not correspond to the 45° angle to the long axis of the tooth as expected, but some of the bristles are actually parallel to the tooth surface. different from conventional toothbrushes where the position of the bristles when used to brush teeth can be directed 45° towards the long axis of the teeth. Electric toothbrushes such as the U-shaped toothbrush also have a large handle that contains the battery, whereas the handle on a conventional toothbrush can vary and there is no battery storage.

5. The Effectiveness of U-Shape Toothbrush and Conventional Toothbrush

Dental plaque is a soft granular deposit that is generally firmly attached to the tooth surface. Dental plaque can also adhere to other rough surfaces in the oral cavity, such as dentures, restorations, orthodontic devices, and so on. The process of dental plaque formation is divided into three phases, namely the pellicle formation phase on the tooth surface, the initial adhesion or bacterial attachment phase and the maturation or plaque colonization phase. Plaque control needs to be done to prevent accumulation of bacteria and increase in plaque mass.

Plaque control is the reduction of microbial plaque and the prevention of its accumulation on the teeth and adjacent gum surfaces. Plaque control is a preventive measure aimed at removing dental plaque and preventing it from reappearing. Mechanically, plaque control can be carried out daily by brushing and flossing. Toothbrush is a mechanical tool that is considered the most effective for cleaning plaque. Over time, various types of conventional and electric toothbrushes have been produced. A U-Shaped toothbrush is a type of electric toothbrush in the shape of a horseshoe with silicone bristles and a conventional toothbrush is an instrument that is generally used to remove debris and plaque from teeth.

Comparison of the effectiveness of electric U-Shaped toothbrushes and conventional toothbrushes has been evaluated in several studies. Research by Nieri M, et al., in 2020 was conducted to determine

the effectiveness of an electric U-Shaped toothbrush in removing dental plaque. This study used a randomized controlled trial cross-over design. There were 22 samples taken from 31 populations with an age range of 18-30 years which were divided into 4 groups. Group U is a group of electric U-Shaped toothbrushes, group P is a group of conventional toothbrushes, group H is a group with the habit of brushing teeth with usual home hygiene techniques (electric or manual toothbrushes without toothpaste). Group N is a group that did not brush their teeth (negative control).

Participants were instructed to use their own toothbrush and toothpaste at home at each study visit. Participants were also instructed not to perform any other oral hygiene measures and asked not to chew gum (for approximately 12 hours) before the time of the visit. At the first study visit, participants provided signed informed consent, and who met the requirements in terms of inclusion and exclusion criteria, then participants were examined. Participants examined plaque by using a disclosing solution that was applied to the teeth with cotton pellets. The examiner then examined the underlying plaque with a magnifying system (EyeMag Pro S 4.5X, Zeiss, Jena, Germany) using the Full-Mouth Plaque Score (FMPS) at 6 locations per tooth.

After that, each participant was instructed to brush for 2 minutes with a designated toothbrush, without toothpaste, under supervision, and with the aid of a mirror. After brushing their teeth, a second plaque examination was carried out on the participants. The same procedure was followed for each visit in rotation, 7 days apart.

The results of a study conducted by Nieri, et al., showed that there were significant differences in groups U and P, with group P having a lower plaque score. The group with tooth brushing habits and those who used a conventional toothbrush also had a better effect on removing plaque compared to using a U-Shaped toothbrush. The use of a U-Shaped toothbrush shows results that are not effective in removing plaque and is equivalent to not brushing your teeth at all. This may be related to the bristles of the U-Shaped toothbrush which are too short so that they do not reach the surface of the teeth and gums, as well as the shape and size that do not suit everyone's dental arches.

Subsequent research has been carried out by Schanbl D, et al in 2020. This study used a randomized-controlled crossover pilot study design. There were 20 participants who were divided into 2 groups. Group 1 is the group using an electric toothbrush (amabrush), group 2 is the group using a conventional toothbrush. Participants were asked to attend 4 meetings and were explained the research procedure and signed informed consent. Plaque index was examined using a disclosing agent. Participants were asked not to brush their teeth, use dental floss or other interdental cleaning devices, and use mouthwash and were asked not to chew gum for 3 days.

At the second meeting, participants in group 1 were asked to brush their teeth using an electric toothbrush (amabrush) for 10 seconds, then group 2 were also asked to brush their teeth with a conventional toothbrush for 4 minutes, then a plaque index was recorded and this was repeated until the meeting. fourth, jaw molding was performed using alginate.

The results of a study conducted by Schanbl, et al., showed that there was no decrease in the plaque index when using a U-Shaped toothbrush, this was related to poor quality bristles and an inappropriate shape of the bristles so that the bristles were not in an optimal position with teeth and the size of the toothbrush that is too wide. This shows similar results to a study conducted by Nieri M, et al.

Research Nieri M, et al. also showed that there was no decrease in the plaque index when using a U-Shaped toothbrush, this was related to the bristles of a U-Shaped toothbrush that were too short so that they did not reach the surface of the teeth and gums, and the shape and size did not suit everyone's dental arch.

CONCLUSION

U-Shaped toothbrushes are automatic electric toothbrushes with silicone bristles that clean the upper and lower jaws simultaneously, while conventional toothbrushes clean teeth using conventional toothbrushes one tooth at a time.

The use of a U-Shaped toothbrush shows results that are not effective in removing plaque and is equivalent to not brushing your teeth at all. This can be caused by several factors such as U-Shaped toothbrush bristles that are too short so they do not reach the surface of the teeth and gums, shapes and sizes that do not match the shape and size of everyone's dental arch, poor quality bristles and the shape of bristles not suitable so that the bristles are not in an optimal position with the teeth and the size of the toothbrush is too wide

Brushing your teeth using a conventional toothbrush is also still better at removing plaque than using a U-Shaped toothbrush.

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