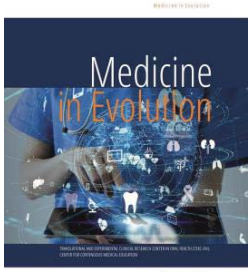
Oral health: investigating the impact of auxiliary techniques on dental plaque removal



Lile I.E.[1], Baroni G.[1], Popovici R.A.[2], Freiman P.C.[1], Vaida L.[3], Stana A.[4], Stana O.L.[1*], Marian D.[1], Ilyes I.[1], Berari A.[1], Hosszu T.[1]

[1]*Department of Dental Medicine, Faculty of Dentistry, "Vasile Goldis" Western University of Arad, Romania*
[2]*Department I, Faculty of Dental Medicine, University of Medicine and Pharmacy "Victor Babeş, Timişoara*
[3]*Department of Dentistry, Faculty of Medicine and Pharmacy, University of Oradea, Romania*
[4]*Department of Medicine, Faculty of Medicine, "Vasile Goldis" Western University of Arad, Romania*

Correspondence to:
Name: Otilia Lavinia Stana
Address: Department of Dental Medicine, Faculty of Dentistry, "Vasile Goldis" Western University of Arad, Romania, Arad, Str. Liviu Rebreanu, nr. 86, Campusul Universitar „Vasile Goldiş"
Phone: +40 740662199
E-mail address: stana.otilia@gmail.com

Abstract

Often the patients are facing a wide range of toothbrushes, and they are faced with a dilemma, not knowing which one to choose, so the purpose of this study is to determine the efficiency of the various toothbrushes. In this sense, the study aims to analyze a series of toothbrushes with different characteristics: size, shape, hardness of the brush and length of the brush. By using a series of techniques we were able to evaluate their effects before and after cleaning the teeth. Initially, the amount of bacterial plaque present in the dental-periodontal structures of the oral cavity was revealed. For the evaluation of the dental plaque we used the Silness Loe plaque index and to evaluate the best toothbrush I asked the patients to use Bass's brushing technique. For coloring the plaque, red dye FDC Nr. 30 was used.

Keywords: dental sealing, minor lesions, sealants, composite, erosion

INTRODUCTION

Bacterial plaque, a biofilm that forms on tooth surfaces due to bacterial colonization, manifests in colorless, white, or yellow hues. With a well-organized structure comprising various bacterial types, plaque formation is influenced by factors creating tooth surface roughness, facilitating bacterial adhesion and growth. The presence of plaque can contribute to periodontal diseases and dental decay. Diverse methods, encompassing both subjective and objective scoring systems, have been proposed for assessing plaque deposits [1] [2] [3] [4].

There are nearly 25,000 species of bacteria involved in bacterial plaque formation, a microbial system with a rich metabolic activity. Not removed daily, dental plaque causes cavities, periodontal disease and tartar. Initially, the plaque is soft enough to be mechanically removed. In 48 hours, it begins to harden, and in 10 days it becomes tartar, much more difficult to remove. Dental plaque forms a sophisticated microbial biofilm community encompassing hundreds of bacterial species, serving as a significant catalyst for oral infections, cavities, periodontal disease, and the creation of tartar. The inception of plaque development commences with the attachment of primary colonizers to oral tissues, succeeded by coaggregation and the establishment of a dense biofilm matrix [5] [6]. The plaque biofilm, marked by its high dynamism, undergoes alterations in both taxonomic composition and functional capacity throughout its maturation [7].

Failure to remove plaque on a daily basis results in its solidification into tartar, presenting a more formidable challenge for elimination [8]. The microbial community within the plaque biofilm exhibits robust metabolic activity, and its dysbiosis significantly contributes to the instigation and progression of periodontal diseases [9]. Hence, effective control of plaque holds paramount importance in preserving oral health and thwarting the onset of dental diseases.

Oral biofilm, constituting a complex microbial community with numerous bacterial species [10] [11], plays a pivotal role in the progression of oral disorders, ranging from incipient lesions to intricate clinical cases. The onset of biofilm development occurs as primary colonizers attach to oral tissues and engage in coaggregation [12]. Employing revealing solutions, such as extracts from red dragon fruit peel and mangosteen rind, proves beneficial in visually appraising and evaluating the adhesive capabilities of the biofilm [13].

Various biofilm indices have been suggested to assess its accumulation, encompassing non-quantitative approaches grounded in clinician observation and quantitative methods for objective measurement [14]. The plaque begins to form immediately after eating and, if not removed, can cause very serious problems. At first it causes inflammation of the gums (gingivitis) and over time can lead to periodontitis, a disease that affects the periodontium, causing the loss of teeth, with consequent functional problems at the level of dental occlusion and aesthetic problems.

The primary dental plaque can be removed by brushing the teeth correctly, which helps to remove the formed film and the soft deposits on the dental and gum surfaces [15]. Tartar, in dentistry, is a deposit also due to the presence of calcium salts in saliva. It is a set of mineral compounds formed by about 80% from inorganic salts, containing phosphorus, calcium and sodium, and the remaining 20% from other substances. Dental brushing is recommended after each meal or twice a day, in the morning and in the evening. Using combine methods in removing dental plaque is necessary for a good oral health, and implies using toothbrushing and auxiliary means such as dental floss [16]. There are several brushing techniques, for example Charters technique, Bass technique, Stillman technique and Fones technique. These techniques differ by: positioning of the bristles, their hardness but also by

the performed movements, etc. There are several methods to assess bacterial plaque status, by means of bacterial plaque indices, with the help of revealing substances [16-24].

Aim and objectives

The objective of this study was to evaluate the effectiveness of diverse toothbrush types, varying in both bristle hardness and design, in eliminating bacterial plaque from the vestibular aspect of teeth in participants aged 20 to 29. The study aimed to discern the most efficacious toothbrush by applying the Silness Loe plaque index and the BASS brushing technique, taking into account the array of toothbrush variations. This endeavor seeks to provide nuanced insights into the interplay of toothbrush type and brushing technique on dental plaque removal and overall oral hygiene among young adults pursuing dental medicine.

MATERIAL AND METHODS

The study was conducted in the Vlaicu Policinica, within the hours of oral-dental prevention. The study included a number of 25 participants, ranging in age from 20 to 29, these being students of 2nd year of dental medicine. From the point of view of the form we evaluated about 10 types of toothbrushes.

After choosing a method of evaluation of the plaque index, that of Silness Loe was choosed, which takes into consideration only the vestibular face of the teeth, during the consultation, and we evaluated it to all participants in the study. To better highlight the deposits in order to determine the plaque index, although the requirements of this index do not require it, a relevant substance was used: Red FDC Nr. 30, to facilitate the evaluation of the results. All participants used different types of brushes, with diffrent hardness of the bristles, and we were able to evaluate for each participant the best toothbrush in removing the bacterial plaque by plate index and BASS brushing technique.

According to the Silness Loe (ISL) index, the index of the plate is done in two stages: with a simple inspection a score of 2 or 3 can be given, for a visible accumulation of plaques, and with the help of a periodontal probe, if the plaque is not visible, the tooth surface is tracked at the gingival margin, after which the tip is examined; if we do not notice anything, it is scored with 0, if there is a plaque on the probe, it is scored with 1. The 0 to 3 rating is made according to the following criteria: 0 represents the absence of plaque, 1 means the adhesive film at the free gingival margin, at the neighboring dental surfaces, which is observed by taking the probe on the tooth surface, 2 means moderate accumulation of white deposits at the gingival margin, which is observed upon inspection, 3 represents the abundance of white matter in the gingival pouch, on the tooth and on the gingival margin

In the study participants were asked to use BASS brushing technique to remove the bacterial plaque. According to it the brush was placed with oblique bristles, at an angle of 45 degrees, so that the tip of the brush rests on the dental faces and on the edge of the gum. Twenty horizontal movements were made, on each segment of the arch, in order to allow the brushes to penetrate into the gingival grooves and interdental spaces. On the oral side the brush was applied with the vertical handle, and at the level of the occlusal faces the brushes were placed perpendicularly, to penetrate the occlusal ditches and ditches.

Several types of toothbrushes were included in this study, which varied in both shape and hardness of toothbrushes. Thus from the point of view of the bristles they were: extrasoft, hardness noted in the study with ES, soft, scored with S, average scored with M, hard scored with H and extra hard scored with EH.

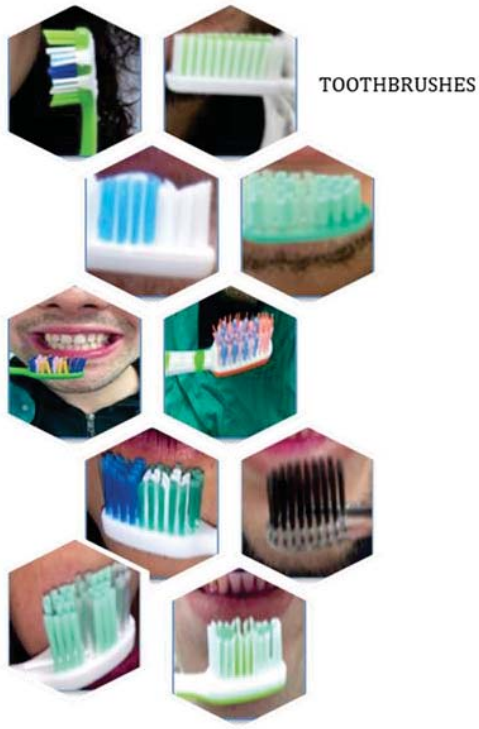


Figure 1. Types of toothbrushes

T1, had the head of the big brush, and the tip was round. Also the lateral bristles were oblique, being in different lengths, aiming at interdental cleaning.

T2 had the head of the rectangular thin brush. The bristles were all the same length and were soft as hardness, no damage to the gums.

T3 had thin head with a rounded tip. The bristles were hard and of different lengths. He had some very short bristles not to cause damage to teeth surfaces while the longer ones do interdental cleaning.

T4 was thin-skinned, with rounded head and medium hardness tufts.

Type 5, T5 had medium hardness bristles and positioned in different directions. It also had 4 rubber tufts, very useful for interdental cleaning.

T6 had soft hardness tufts, was thin and had some filimormous bristles to reach interdependent spaces and to pass it from one side to another for a very efficient cleaning.

T7 had bristles of different lengths and medium hardness.

T8 had bristles of different lengths, higher to the middle and bristles were like thin threads. It was soft hardness.

T9 was hard hard but had different lengths with the area towards the concave tip. At the top the bristles were higher to clean the retromolar spaces well.

The T10 was extra hard and had higher lateral and shorter bristles in the central area.

CASES

We selected several cases to present, in order to demonstrate the effectiveness of several types of toothbrushes. In the study we observed that the type of the toothbrush influences the outcome of the hygiene in different patients but this can be of course due to using a correct technique.

Figure 2. Patient before and after toothbrushing with an extra hard toothbrush

Before brushing, after coloring the index plaque: 1
Toothbrush hardness: extra hard
After staining, after brushing the index plate: 1

Figure 3. Patient before and after toothbrushing with a medium toothbrush

Before brushing, after coloring the index plaque: 1
Toothbrush hardness: Medium
After staining, after brushing the index plate 0/1

Figure 4. Patient before and after toothbrushing with an medium toothbrush

Before brushing, after coloring the index plaque: 0
Toothbrush hardness: Medium
After staining, after brushing the index plate: 0

RESULTS

We evaluated 25 patients out of these 5 were women and 20 were men.

Of the patients we examined 4 were 21 years old, 2 patients were 23 years old, 2 patients were 24 years old, 1 was 25 years old, 4 patients were 26 years old, 1 patient was 27 years old, 4 patients aged 28 and 2 patients were 29 years old.

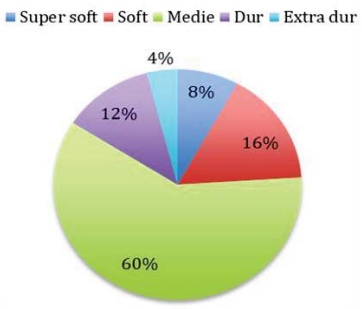


Figure 5. Percentage of different types of toothbrushes bristle used in the study

Between the brush used 2 were super soft, 4 were soft, 15 were average, 3 hard and one extra hard.

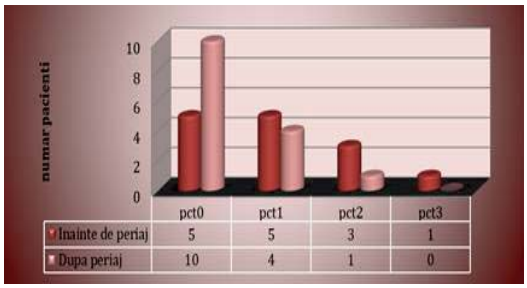


Figure 6. Evaluation of the ISL plaque index before and after brushing

Silness and Loe index before brushing before brushing was 0 for 5 people, 1 for 5 people, was 2 for 3 people and 3 for 1 person.

After brushing the Silness and Loe index was 0 for 10 patients, 1 for 4 patients, 2 for one patient and there was 3 for no patients.

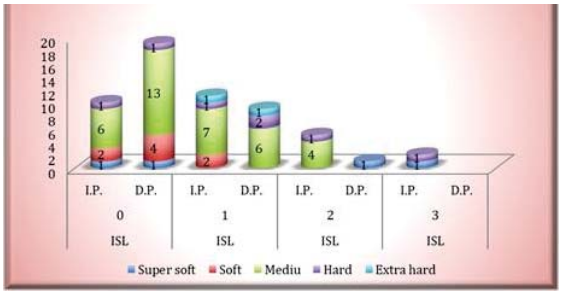


Figure 7. Before and after toothbrushing using different types of toothbrush bristle

When evaluating the ISL plaque index according to the hardness of the toothbrushes bristle, we found the following results:

-2 patients had super soft brush and these had SL 3 index before brushing and after 1.

-4 patients had soft brush and between these 2 had ISL 0 before brushing and 2 ISL = 1. All had after ISL brushing = 0.

- 15 patients had medium hardness brush and between these 4 had ISL = 2 before brushing, 6 had ISL = 1 and 5 had ISL = 0.

After brushing 13 they had ISL = 0 and 2 ISL = 1.

- 3 patients had a hard brush and before brushing they had respective ISL = 3, ISL = 2, ISL = 1.

After brushing 2 had ISL = 2 and 1 had ISL = 1.

- 1 patient had an extra hard brush and had before and after brushing ISL = 1.

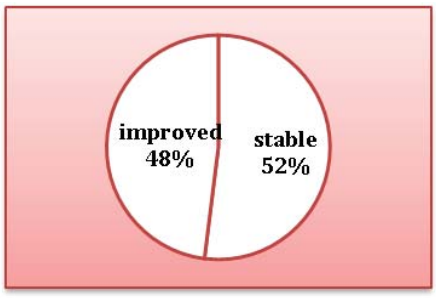


Figure 8. The percentage of patients with improved oral hygiene

I saw 13 colleagues who were stable and 12 who had improvement.

10 out of 13 stable colleagues from the beginning had plate index = 0.

After the correct brushing technique, it must be noted that it is important to use next to it and other mechanical cleaning methods: dental floss, interdental brushes, using interdental stimulators.

DISCUSSIONS

The outcomes of this investigation illuminate the influence of diverse toothbrush types on oral hygiene, assessed through the Silness Loe (ISL) plaque index. The array of toothbrush designs portrayed in Figure 1 illustrates distinctive features impacting interdental cleaning and plaque removal. The depicted cases in Figures 2, 3, and 4 vividly demonstrate the immediate effects of toothbrushing with varying bristle hardness on the plaque index. The demographic distribution of the study cohort (25 patients, predominantly men, aged 20 to 29) offers a snapshot of age and gender representation. While the sample size is modest, it provides insights into the oral hygiene practices of young adults pursuing dental medicine. The diversity in toothbrush bristle types (super soft, soft, average, hard, extra hard) reveals a spectrum of choices among participants. The prevalence of medium hardness brushes, favored by the majority, suggests a common preference, potentially influenced by a balance between efficacy and comfort. The assessment of the ISL plaque index before and after brushing unveils noteworthy enhancements across all categories. Particularly, patients using medium hardness brushes predominantly exhibited a transition from higher ISL scores to lower ones after brushing, indicating effective plaque removal. These findings align with existing literature underscoring the critical role of proper brushing techniques in sustaining oral health. The correlation between toothbrush hardness and ISL scores underscores the impact of bristle characteristics on plaque removal. Super soft and soft brushes demonstrated effectiveness, while medium hardness brushes showed varied outcomes. The study's noteworthy discovery lies in the efficacy of the extra hard brush in achieving and maintaining a low ISL score, underscoring its potential in specific oral care contexts. The evaluation of enhanced oral hygiene among participants following the adoption of correct brushing techniques reinforces the pivotal role not only of toothbrushes but also of complementary mechanical cleaning methods. The recommendation to integrate dental floss, interdental brushes, and stimulators alongside proper brushing emphasizes the holistic approach necessary for optimal oral hygiene. In conclusion, this study provides information about toothbrush types, brushing techniques, and oral hygiene outcomes. Further research with a larger and more diverse sample could augment the generalizability of these findings, contributing to the ongoing discourse on personalized oral care strategies.

CONCLUSIONS

After this evaluation it can be said that the type of toothbrush it is important but also the correct brushing technique play an important role in maintain a good oral health

After evaluation it was estimated that the best brush can be considered the medium hardness, with the tufts of different lengths and for removing the bacterial plaque and in view of the fact that we could find that the hard and extruded brushes cause gingiva and cause bleeding. It was also found that medium hardness brushes are the most chosen of the colleagues. Also an important role in the evaluation of plaques can be the time elapsed since the last dental scaling was done by a dentist.

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