DENTAL PLAQUE – CLASSIFICATION, FORMATION, AND IDENTIFICATION

Viorica CHETRUŞ[1], I.R. ION[2]

1. Assoc. prof. PhD, Therapeutical Dental Dept., Medical Dentistry Faculty, Chisinau, Rep. of Moldova
2. Assoc. resident III[rd] year Therapeutical Dental Dept., Medical Dentistry Faculty, Chisinau, Rep. of Moldova

Contact person: Viorica Chetrus, e-mail: viorica_1966@yahoo.com

Abstract

The aim of this study was to present the most effective and easiest ways to diagnoze dental plaque, and to distinguish some modern and effective methods for its removal. **Materials and method.** The study was performed on 34 patients aged between 19-42 years. For dental plaque detection, the (QHT) index in two different - initial and final – stages, was used. For the removal of sub-gingival and supra-gingival soft and hard deposits, scaling was used, as well as AIR FLOW professional brushing for plauqe removal. **Results and discussion**. Evaluation of the QHT index showed the presence of of dental plaque 100% of cases. All patients were subjected to post-treatment, the QHT index showing a 100% removal of plaque after AIR FLOW application, and a 86% one, respectively, after professional cleaning. **Conclusions.** Dental plaque diagnosis using colors solutions is one of the easiest and fastest ways to diagnose dental plaque, which favors its subsequent removal under premanent control. When using air flow, dental plaque removal approaches a 100% ratio.

Keywords: *dental plaque, AIR FLOW, professional cleaning, index, bacteria*.

INTRODUCTION

The theme of this study is quite captivating through the way of its approach, evolution and frequency. Even if we live in an age of luminescence, all domains, including medicine, addressing patients with dental plaque appears as more imposing only with other concomitant diseases.

Throughout life, all interface surfaces of the body are exposed to colonization by a wide range of microorganisms. Generally, the established microbiota live in harmony with the host. Constant renewal of the surfaces by shedding prevents the accumulation of large masses of microorganisms. In the mouth, however, teeth provide hard, non-shedding surfaces for the development of extensive bacterial deposits. The accumulation and metabolism of bacteria on hard oral surfaces is considered **the primary cause of dental caries, gingivitis, periodontitis.**

Massive deposits are regularly associated with localized diseases of the subjacent hard or soft tissues. In **1 mm^3** of dental plaque weighing approximately 1 mg, more than **10^8** bacteria are present. Although over **300 species** have been isolated and characterized in these deposits, it is still not possible to identify all present species. [1]

CLASSIFICATION OF DENTAL PLAQUE

The dental plaque is differentiated into two categories by Pavel Godoroja and Olga Dulghieru 2004 [2], namely: supra- and sub-gingival.

Supra-gingival plaque at and above the dento-gingival junction is most commonly found at:

- Gingival third of the crown of the tooth
- Inter-proximal areas
- Pits and fissures and also on other such surface with irregularities.

Sub-gingival plaque below the dento-gingival junction is usually divided into:

- Tooth adherent zone
- Epithelial adherent zone
- Non adherent zone [2].

FORMATION OF DENTAL PLAQUE BIO-FILMS

From the moment a baby passes through the birth canal and takes its first breath, microbes begin to reside in its mouth. Later on, as teeth erupt, additional bacteria establish colonies on the tooth surfaces. Dental bacterial plaque is a bio-film that adheres tenaciously to tooth

Table I. Phases of plaque formation

1	**Pellicle formation** A thin bacteria free layer forms within minutes on cleaned tooth surface
2	**Attachment** Within hours, bacteria attach to the pellicle and a slime layer is formed around the attached bacteria
3	**Young supra-gingival plaque** Young supra-gingival plaque consists mainly of gram-positive cocci and rods, some gram-negative cocci and rods
4	**Aged supra-gingival plaque** In aged supra-gingival plaque, there is an increase in the percentage of gram-negative anaerobic bacteria
5	**Sub-gingival plaque formation** Tooth-attached plaque, mostly gram-positive bacteria, with some gram-negative cocci and rods Epithelial attached and unattached plaque, mostly gram-negative rods and spirochetes

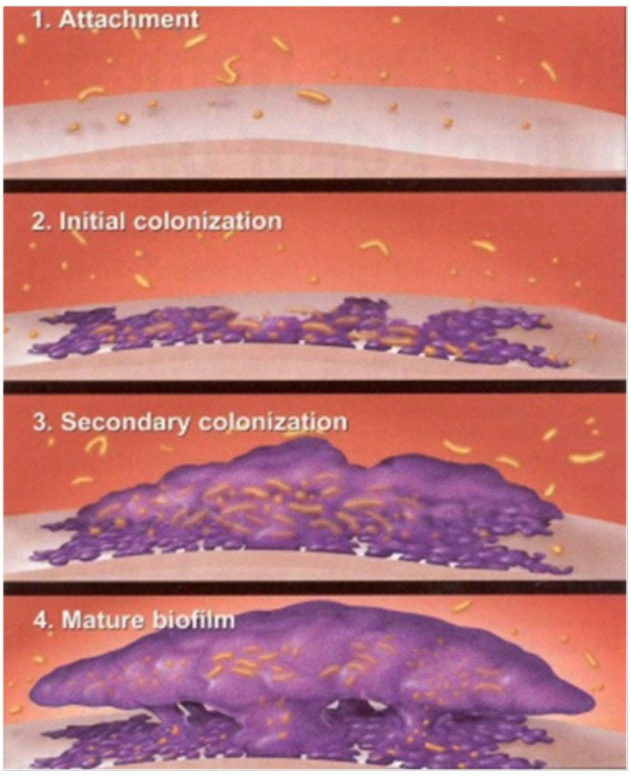

Fig. 1 Pattern of bio-film development. Stages of bio-film maturation: 1. Attachment 2. Initial colonization 3. Secondary colonization 4. Mature bio-film

surfaces, restorations, and prosthetic appliances. Understanding the formation, composition and characteristics of the plaque bio-film assists in its control. (Table I) The pattern of plaque bio-film development includes three phases:

1. Attachment of bacteria to a solid surface;
2. Formation of micro-colonies on the surface;
3. Formation of mature, sub-gingival plaque bio-films (Fig.1). [3-5]

DENTAL PLAQUE IDENTIFICATION

Identification of the supra-gingival dental plaque is difficult for both patient and dentist, because of the color similarity between the tooth surface and dental plaque. Plaque identification may be done either by screening the plaque directly from the tooth surface [6], changing its color with a disclosing solution [7], or by using the ability of natural teeth to fluoresce under blue light [8]. Disclosing dyes work by changing the color of dental plaque so that it contrasts with the white tooth surface. Dental plaque has the ability to retain a large number of dye substances which can be used for disclosing purposes. This property is related to interaction, because of the polarity difference between the components of the plaque and the dyes [9]. The particles are bound to the surface by electrostatic interaction (proteins) and hydrogen bonds (polysaccharides). Over the years, different staining agents have been used.

The first chemical reported to stain plaque was **iodine** [10] but, over the time, a variety of dyes have been used, such as: [11, 12]

- fuchsine
- erythrosine
- merbromin
- methylene blue
- brilliant blue
- crystal violet
- gentian violet
- fluorescein [13].

AIM OF THE STUDY

The present study attempts at finding out the most effective and easiest ways to diagnose dental plaque, to distinguish some modern and

effective methods for its removal, and to educate patients on oral hygiene compliance for a better life.

MATERIALS AND RESEARCH METHODS

The study was performed on 34 patients, aged between 19-42, selected according to the way they came for medical care to the University Dental Clinics of ”Nicolae Testemisanu’’ USMPh of Chisinău, Moldova; out of these, 21 (61.76%) were females 13 (38.23%) were males, 14 smokers (41.17%) and 20 non-smokers (58.82%), 2 patients (5.88%) following orthodontic treatment.

For dental plaque detection there were used: Quigley and Hein modified by Turesky (QHT) index in two different (initial and final) stages, with fuchsin coloration, Loe and Silness index , Muhlemann index.

For removing the soft and hard sub- and supra-gingival deposits, scaling was applied. For plaque removal, AIR FLOW with powder of sodium bicarbonate was used in 28 (82.35 %) cases and professional brushing with paste ,,Polident’’, respectively, in 6 cases (17.64%).

For rainfall irrigation, antiseptic solutions (chlorhexidine 0.06%, hexoral) were used, for messotherapy - BIOR, for application - Metrogel Denta. Generally, the treatments made use of Aevit pills and Ascorutin.

CLINICAL CASE

Subjects’ examination

Symptoms: the patient complains of gingival pruritus, mild pain, burning, bleeding gums, especially when brushing, cutting hard foods (apple, carrot, bread), fetid smell from the mouth, aesthetic defects.

Endobucal exam: The red edges of the lip are pink. Scales and crusts are not present. Vestibule is of medium depth. Labial frenulum is of the medium type (4 mm) from the top of papilla.

Based on complaints of patient’s history and subjective and objective examination of the disease, the diagnosis of chronic catarrhal gingivitis generalized mild form was established.

Initial look of dental arches

Fig. 2. Before the treatment

Working tools (Air flow piece, prophylaxis powder for air flow, sodium bicarbonate, and plaque finder pills)

Fig. 3. Air Flow, plaque finder pills, air flow powder

Preparation solutions for dental plaque colouring

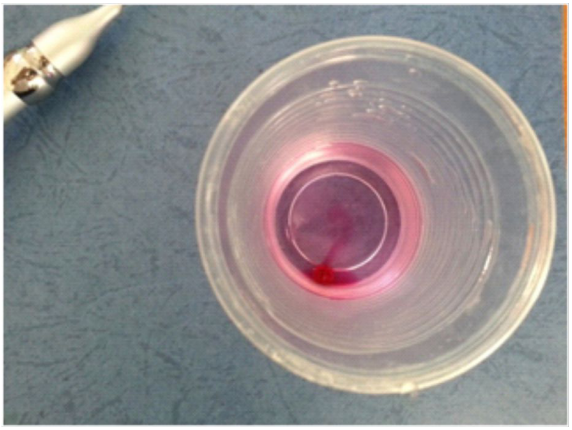

Fig. 4. Preparation plaque finder solution

Dental plaque coloration after applying the solution, appreciation of dental plaque index

a

b

Fig. 5. Coloration of dental plaque a. vestibular part b. lingual part

After finishing professional cleaning and double check of dental plaque presence

Fig. 6. After the treatment

Patient education for a correct cleaning and maintaining of oral hygiene

Fig. 7. Hygiene education

Evaluation of the QHT index of dental plaque presence was documented in 100% of cases. In 6 cases (17.64%), dental plaque removal involved professional brushing with "Polident" paste, and in 28 (82,35%) cases – AIR FLOW with sodium-bicarbonate. The post-treatment QHT index of all patients showed 100% removal of plaque when using AIR FLOW, and 86%, respectively, after professional cleaning.

CONCLUSIONS

The present study shows that dental plaque diagnosis using coloured solutions is one of the easiest and fastest ways to diagnose dental plaque, which favors its subsequent removal under permanent control during the intervention. Using air flow, removing of dental plaque approaches a ratio of 100%.

Educating patients on better oral hygiene was our basic prerogative after the treatment, as demonstrated by the obtained results.

References

1. Lindhe J, Karring T, Lang NP. Clinical Periodontology and Implant Dentistry. Blackwell Munksgaard Oxford, 5th ed. 2008, p. 183.
2. Godoroja P, Dulghieru O. Propedeutics and preventive dentistry. Chisinau: CEP Medicina 2004, p. 99.
3. Nield-Gehrig JS, Willmann DE. Foundations of periodontics for the dental hygienist. 2nd ed.: Lippincott Williams & Wilkins; 2008.

4. Wilson M, Devine D. Medical implications of biofilms. Cambridge University Press. 2003, Vol. 1, p. 173.
5. Jass J, Surman S, Walker J. Medical Biofilms, Detection, Prevention and Control. Wiley 2003, Vol. 2, pp. 173-192.
6. Löe H. The Gingival Index, the Plaque Index and the Retention Index Systems. J Periodontol. 1967: 38(6):610-616.
7. Gillings, BRD. Recent developments in dental plaque disclosants. 1977:22 (4):260-266.
8. Lang NP, Ostergaard E, Löe H. A fluorescent plaque disclosing agent. J Periodontol Res. 1972:7:59-67.
9. Gallagher IH, Fussell SJ, Cutress TW. Mechanism of action of a two-tone plaque disclosing agent. J Periodontol. 1977:48: 395-396.
10. Skinner FH. The prevention of pyorrhea and dental caries by oral prophylaxis. D Cosmos 1914:56:299.
11. Reyes Silveyra LJ. Investigations on automated methods for dental plaque detection. Ph.D. thesis, University of Birmingham, 2011.
12. Wolf HF, Hassell TM, Periodontology. Thieme 2006; p. 68.
13. Tan AE. Disclosing agents in plaque control: a review. Journal of the Western Society of Periodontology Periodontal Abstracts. 1981, 29:81-86.