Annals of R.S.C.B., Vol. 24, Issue 1, 2020, pp. 442 - 446
Received 18April2020; accepted 23June2020

Chemical Plaque Control Agents And Its Uses In Preventing Periodontal Disease – A Systematic Approach

Preethi Shankar, Ashok Kumar*, C. BurniceNalina Kumari, Jaideep Mahendra, N.Ambalavanan

Meenakshi Academy of Higher Education and Research, Faculty of Dentistry, Meenakshi Ammal Dental college and Hospital, Chennai, India.

Higher Education and Research, Chennai, India.

drashok.perio@madch.edu.in

ABSTRACT

Dental plaque adheres to the numerous hard surfaces in the mouth and is extremely difficult to remove just by rinsing. The complex plaque structure is responsible for a variety of periodontal illnesses, so plaque removal should be done on a regular basis to maintain proper dental hygiene. The cornerstone for disrupting plaque accumulation is mechanical debridement.In individuals with severe periodontal disease, chemical plaque control treatments can be used as a supplement to mechanical plaque control. This article will examine the various chemical plaque control agents and their applications.

Keywords: Plaque control, chemical plaque control, oral hygiene

I.Introduction

Because mechanical plaque management, a diverse method, has not been able to attain a completely plaque-free condition, chemicals have been used as an adjuvant in plaque control. The increased interest in chemicals for plaque reduction has been fueled by a better awareness of the infectious nature of dental illnesses and the incapacity of many people to remove plaque on a daily basis. Chemical plaque control should be regarded as an adjunct to and not a substitute for mechanical plaque control.

II. Principles of chemical plaque control

Chemical plaque control involves the prevention of plaque formation, the removal and breakdown of existing plaque, the suppression of plaque calcification, the inhibition of microbial colonisation of the tooth surface, and the transformation of pathogenic plaque into a less pathogenic form.

III. History of agents used

In 1500B.C., the Ebers papyrus had recipes for tooth powders and mouth rinses. White wine was utilised in the mouth rinses of the Romans. Urine was used to rinse the mouth. France's Cantabri&Fauchard [1670-1761][1]. Peabody, a dentist, was the first to add soap to toothpaste in 1824. John Harris transformed chalk to toothpaste in the 1850s. Colgate was the first toothpaste in a jar that was mass-produced commercially. Dr. Washington Sheffield began producing toothpaste in a collapsible tube in 1892. Mouthwashes on the market now contain antimicrobial ingredients. They stop bacteria from forming plaque and stay in the mouth for a long period.

Annals of R.S.C.B., Vol. 24, Issue 1, 2020, pp. 442 - 446
Received 18April2020; accepted 23June2020

IV. Classification of Chemical plaque control agents

They can be classified into three generations[1,2] First-generation agents – effective in vitro but lack substantivity and are not as effective in vivo; Second-generation agents – substantive and effective in vivo and Third-generation agents – block microbial colonization

Based on the chemical composition of the agents[1]Bisbiguanides – chlorhexidine, alexidine, Bispyridines – octenidine hydrochloride, Halogens – iodine, iodophores, fluorides, Heavy metal salts – silver, mercury, zinc, copper, tin, Herbal extracts – sanguinaria extract, Oxygenating agents – peroxides, perborate, Phenolic compounds – phenol, thymol, triclosan, 2-phenylphenol, hexylresorcinol, Listerine, Pyrimidines – hexetidineand Quaternary ammonium compounds – cetylpyridinium chloride, benzethonium chloride, domiphen bromide

Classification by Mandel [2] Antiplaque enzymes Amyloglucosidase, glucose oxidase, dextranase, fungal enzymes, mucinase, mutanase, pancreatin, proteinase-amylase, zendium and Plaque – modifying agents Ascoxal (astrazeneca), urea peroxide.

Based on chemical composition: Cationic, Anionic, NonionicandOther combinations

V. Mechanism of action of chemical plaque control agents

Plaque builds up on the teeth's clean surfaces, making these areas vulnerable to illness. When it comes to mechanical plaque control, patient motivation is crucial. Chemical plaque control chemicals interfere with biofilm composition and metabolism and operate as a supplement to mechanical plaque control.Antiplaque agents work by eliminating or disturbing biofilms, as well as preventing new biofilm formation. Bacteriostatic or bactericidal antimicrobial agents are available.[3,4] Depending on the microorganisms they target, these medicines may be limited spectrum or broad spectrum.Antimicrobial agents' effectiveness is proportional to their concentration and contact time. The oral biofilm microorganisms become resistant to the antimicrobial drugs used over time.

VI. Chlorhexidinemouthrinse

Chlorhexidine, a diguanidohexane with prominent antiseptic characteristics, has exhibited the most positive antibacterial results to date. Several clinical studies corroborated an early result that two daily rinses with 10 mL of a 0.2 percent aqueous solution of chlorhexidinedigluconate almost completely prevented the formation of microbial plaque biofilm, calculus, and gingivitis in tetracycline-resistant bacteria.[5]Plaque biofilm reductions of 45 percent to 61 percent and, more crucially, gingivitis reductions of 27 percent to 67 percent were documented in clinical tests lasting several months.[5,6] For reducing plaque biofilm and gingivitis, the 0.12 percent chlorhexidinedigluconate preparation available in the United States has been demonstrated to be just as effective as the higher-concentration version..[7,8]Brown staining of the teeth, tongue, and silicate and resin restorations, as well as transitory impairment of taste perception, are all reversible side effects of chlorhexidine use.[9] Chlorhexidine has very minimal systemic toxicity in humans, hasn't caused any

Annals of R.S.C.B., Vol. 24, Issue 1, 2020, pp. 442 - 446
Received 18April2020; accepted 23June2020

significant resistance in oral bacteria, and hasn't been linked to teratogenic changes.Chlorhexidinemouthrinse is also available in a non-alcoholic form. It has been demonstrated to be as effective at controlling microbial plaque biofilms[10,11], and patients may prefer it.

VII. Essential oil rinse

Thymol, eucalyptol, menthol, and methyl salicylate are all found in essential oil mouthrinses. In long-term clinical investigations, these formulations showed plaque biofilm reductions of 20 to 35 percent and gingivitis reductions of 25 to 35 percent.[12,13,14] Since the 19th century, this sort of oral rinse has been used on a regular basis with great success, and many people have benefited from it. These products also include alcohol (up to 24 percent depending on the preparation), which may be a factor in some patients' decision to avoid using them.

VIII. Other products

A triclosan-based product has showed some promise in decreasing plaque biofilm and gingivitis. It comes in toothpaste form, and the active component works best when combined with zinc citrate or amethoxyethylene copolymer.[15] Other dental rinses on the market have showed some evidence of plaque biofilm reduction, while long-term gingival healing has not been demonstrated. Stannous fluoride, cetylpyridinium chloride (quaternary ammonium compounds), and sanguinarine are examples of these. To improve the effectiveness of toothbrushing, one type of agent has been marketed as a prebrushing oral rinse. Sodium benzoate is the active component. The evidence for its effectiveness is mixed, but the overwhelming evidence suggests that brushing alone is just as beneficial as utilising a prebrushing rinse. Chemical plaque biofilm control has been shown to be beneficial in reducing plaque biofilm and improving wound healing following periodontal surgery.[16]

IX. Disclosing agents

Disclosing agents are liquids or wafers that stain bacterial biofilm on tooth, tongue, and gingiva surfaces. Before being expectorated, wafers are crushed and washed in the mouth for a few seconds. They can be utilised to improve the efficacy of plaque biofilm control processes by serving as educational and motivational resources.[17]On cotton swabs, solutions are administered to the teeth as concentrations or diluted as rinses. Plaque biofilm, gingiva, tongue, lips, and fingertips are commonly stained. Rinses or wafers can be utilised in the clinic for plaque biofilm control training and supplied for home use to assist periodontal patients in evaluating the effectiveness of their oral hygiene regimen.

X. Clinical application

Individuals must maintain appropriate oral hygiene in order to allow the growth of beneficial organisms in the mouth cavity and to utilise chemical agents to eradicate dangerous microorganisms. A three-pronged strategy should be devised by the clinician for the prevention of oral diseases: (a) Improved oral hygiene, (b) direct targeting of harmful microorganisms, and (c) oralmaintanence.[4,18]Oral care products with antimicrobial ingredients eliminate hazardous key microorganisms that affect oral tissues. Prescriptions for chemical plaque control agents are not the same as medicinal prescriptions.Antibiotics are

given for a set period of time and are directed against specific microbes, but in dental care, antimicrobial agents are given in low doses, unsupervised, and over-the-counter to suppress pathogenic microflora and maintain the oral cavity's ecological homeostasis over long periods of time.[4]As a result, when prescribing chemical plaque management medications, the doctor must pay special attention to each patient's oral environment and risk factors.[19]

XI. Conclusion

Plaque control that is effective requires a long-term commitment from both the dental expert and the patient as a co-therapist. It is the obligation of the dental practitioner to customise the home regimen to increase compliance and satisfy the demands of certain patient groups. The expert must also choose products and procedures objectively based on their safety, efficacy, and side effects.Antimicrobial misuse must be avoided, as antimicrobial resistance is currently posing a serious global concern, with an increasing number of microorganisms developing resistance to routinely used antibiotics.[20] Patients must be willing to talk openly and honestly, as well as commit to their dental health for the long run.

References

1. Mandel ID. Chemotherapeutic agents for controlling plaque and gingivitis. Journal of clinical periodontology. 1988 Sep;15(8):488-98.
2. Newbrun E. Chemical and mechanical removal of plaque. CompendContinEduc Dent 1985;Suppl 6:S110-S116.
3. Marsh PD. Controlling the oral biofilm with antimicrobials. J Dent 2010 Jun;38Suppl 1:S11-S15.
4. Marsh PD. Contemporary perspective on plaque control. Br Dent J 2012 Jun 22;212(12):601-606.
5. Grossman E, Reiter G, Sturzenberger OP, et al. Six-month study of the effects of a chlorhexidinemouthrinse on gingivitis in adults. J Periodontal Res. 1986;21(Suppl):33.
6. Lang NP, Hotz P, Graf H, et al. Effects of supervised 2733chlorhexidine mouthrinses in children: a longitudinal clinical trial. J Periodontal Res. 1982;17:101.
7. Keijser J, Verkade H, Timmerman M, et al. Comparison of 2 commercially available chlorhexidinemouthrinses. J Periodontol. 2003;74:214.
8. Lang NP, Brecx MC. Chlorhexidinedigluconate: an agent for chemical plaque control and prevention of gingival inflammation. J Periodontal Res. 1986;21(Suppl):74.
9. Löe H. Does chlorhexidine have a place in the prophylaxis of dental disease? J Periodontal Res. 1973;8(Suppl 12):93.
10. LeyesBorrajo JL, Garcia Varela L, Lopez Castro G, et al. Efficacy of chlorhexidinemouthrinses with and without alcohol: a clinical study. J Periodontol. 2002;73:317.
11. Bascones A, Morante S, Mateos L, et al. Influence of additional active ingredients on the effectiveness of nonalcoholicchlorhexidine mouthwashes: a randomized controlled trial. J Periodontol. 2005;76:1469.

12. De Paola LG, Overholser CD, Meiller TF, et al. Chemotherapeutic reduction of plaque and gingivitis development: a 6 month investigation. J Dent Res. 1986;65:274 [abstract 941].
13. Gordon JM, Lamster IV, Seiger MC. Efficacy of Listerine antiseptic in inhibiting the development of plaque and gingivitis. J ClinPeriodontol. 1985;12:697.
14. Lamster IB, Alfano MC, Seiger MC, et al. The effect of Listerine antiseptic on reduction of existing plaque and gingivitis. J ClinPrev Dent. 1983;5:12.
15. Arweiler NB, Henning G, Reich E, et al. Effect of an aminefluoride-triclosanmouthrinse on plaque regrowth and biofilm vitality. J ClinPeriodontol. 2002;29:358.
16. Sanz M, Herrera D. Role of oral hygiene during the healing phase of periodontal therapy. Lang NP, Ättstrom R, Löe H. Proceedings of the European workshop on mechanical plaque control. Quintessence: Chicago; 1998.
17. Arnim SS. The use of disclosing agents for measuring tooth cleanliness. J Periodontol. 1963;34:227.
18. Takahashi N, Nyvad B. Caries ecology revisited: microbial dynamics and the caries process. Caries Res 2008;42(6)409-418.
19. Jafer M, Patil S, Hosmani J, Bhandi SH, Chalisserry EP, Anil S. Chemical Plaque Control Strategies in the Prevention of Biofilm-associated Oral Diseases. The journal of contemporary dental practice. 2016 Apr 1;17(4):337-43.
20. Kõll-Klais P, Mändar R, Leibur E, Marcotte H, Hammarstrom L, Mikelsaar M. Oral lactobacilli in chronic periodontitis and periodontal health: species composition and antimicrobial activity. Oral MicrobiolImmunol 2005 Dec;20(6):354-361. 75. Twetman S, Derawi B, Keller M, Ekstrand K, Yucel-Lindberg