

A Review On Mechanical Plaque Control Agents Used In Periodontics

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ABSTRACT

Dental plaque attaches itself onto the various hard surfaces present in the oral cavity and is very difficult to remove just by rinsing. The complex plaque structure is responsible for a number of periodontal diseases and hence the regular removal of plaque is essential to maintain a good oral hygiene for which mechanical plaque control aids are made use of on an everyday basis. Individuals are taught to use proper aids in the right places and in the right manner to bring about an efficient plaque removal and also to not cause much harm intraorally. This article reviews the various aspects of mechanical plaque removal and its benefits.

Key words: *Mechanical plaque control, toothbrush, oral hygiene, mouthrinse, powered toothbrush.*

I.Introduction

Dental plaque and calculus cause harm to the periodontal status and results in periodontal disease.^[1] Colonization of the hard surfaces and structure in the oral cavity by bacteria present in the plaque are the main causes for periodontal diseases.^[2] Plaque control is a precautionary measure to remove the plaque from the tooth surfaces and disrupt its accumulation. The two widest aspects of plaque control are the mechanical or the chemical plaque control measures. The objectives of mechanical plaque control are to remove and/or disturb plaque, remove food debris and stain, stimulate gingival tissue and apply therapeutic agents. To aid in removal of plaque, disclosing agents are made use of to identify and highlight the areas of plaque accumulation for better oral hygiene practices by individuals. Loe *et al.* in 1965 conducted the experimental gingivitis model and showed that gingival inflammation was due to the presence and buildup of plaque and the removal of plaque reversed the gingival condition. It highlighted that mechanical plaque removal of can bring about a healthier gingiva.^[3]

II. Mechanical plaque control aids^[4]

The various mechanical plaque control aids include chewing sticks, tooth brush, interdental aids, tooth picks, wooden tips and rubber tips. The tooth brushes are further classified based on the type of bristle used as natural and synthetic; depending on the function into manual toothbrush, powered toothbrush, single headed, double headed and triple headed; depending on diameter of bristles it is classified as soft, medium and hard and finally depending on the number of tufts present is classified as space tufted and multitufted. The interdental aids includes dental floss/tape and interdental brushes. The dental floss/ tape can be either twisted/nontwisted; bonded/nonbonded; waxed/unwaxed; thick/thin; floss/knitting yarn combinations; monofilament floss; manual floss or powered floss. The interdental brushes can be either cone shaped; cylindrical shaped; small insert with reversible handle; brushes with wire handle, single-tufted marginal brush or multitufted interdental brush.

III. Toothbrush

History dates back the use of tooth brush from 1600 in China where bristled tooth brushes were in existence. To this day, a number of modifications in the size, material, texture number of bristles and tufts and handles have been identified and tested to come up with the most efficient way of plaque removal. They have also evolved into powered toothbrushes for ease and compliance. The selection of tooth brush for patients depends on influencing factors (patient, gingiva, position of teeth, compliance and method selection), tooth brush size and shape and soft nylon brush.

IV. Powered toothbrush

First electric tooth brush was founded, introduced and patented by Frederick Wilhelm, a Swedish clockmaker in the year 1855. ^[5] First powered brushes came with a back and forth action. Later development led to the evolution of rotary action brushes, and more recently higher frequency vibration brushes. The bundles of bristles are arranged either in rows or in a circular pattern mounted in a round head. Bristles are also arranged as more compact single tufts which facilitate interproximal cleaning and brushing in less accessible area of the mouth. ^[6] Silverman *et al.* in 2004 conducted a comparative study in 4–5-year-old children for evaluating plaque removal efficacy between powered and manual toothbrushes. There was no clinical difference between any of the toothbrushes tested during either of the trials with regard to plaque removal or improvement in gingival health. ^[7] A meta-analysis by Vibhute and Vandana in 2012 comparing the efficacy of manual and powered brushes in plaque removal and gingival health stated there was no statistically significant difference between powered and manual brushes. ^[8]

V. Ultrasonic toothbrush

The ultrasonic toothbrush is a manual toothbrush, in which a piezoelectric ultrasonic emitter is embedded in the brush head. The plaque destroying power of ultrasound and the deep, gentle cleansing wave action of sonic vibration penetrate the gumline to a depth of 5 mm. This results in the destruction of the periodontal pathogen.

VI. Ultraviolet sterilized tooth brush system

Since the toothbrushes are not always capped and stored or placed in a clean environment, they tend to harbor a large number of bacteria on them which could contaminate the oral cavity in already periodontally diseased patients. Hence UV pods are useful in homes to place all the brushes in it for sterilization and is proven to be an effective way to keep brushes germ free.^[9]

VII. Ionic brushes

Works on the basis of repulsion between the surface charges of tooth and bacteria. The brush tips give out a charge from the anion lithium battery to repel the Ca^{2+} on the tooth surface.4 Deshmukh *et al.* in 2006 conducted a clinical study to evaluate the effectiveness of an ionic toothbrush on oral hygiene status and noticed a significant reduction in plaque index and gingival index scores and no soft-tissue trauma was noted following the use of ionic tooth brushes.^[10]

VIII. Tongue cleaners

Microflora of tongue changes frequently and has anatomic structures that cause retention of plaque like papillae, fissured tongue. Cleaning by brush or tongue scraper gets rid of this accumulated plaque.

IX. Effects of cleaning:

The various effects of cleaning includes: retarding biofilm formation; reducing number of microorganisms; reducing halitosis and contributing to overall cleanliness. Outhouse(2006)in a systematic review found that scrapers or cleaners were more effective than brushes for tongue cleaning.^[11]

X. Interdental cleaning aids

Depending on the types of embrasure, different interdental aids are used. Three types of gingival embrasure are present: (Holmes, 1965)

Type I: Embrasures are completely occupied by healthy interdental papilla. (Use of dental floss)

Type II: About 75% of embrasure is occupied by the gingiva. (Use of interdental brush)

Type III: About 50% of the embrasure is occupied by gingival. (Use of uni tufted brush)^[12]

XI. Dental Floss

Most widely opted tool for removing plaque from proximal surfaces. It can be waxed or unwaxed. They are an additional aid to tooth brushing and significantly reduces gingival inflammation. It is technique sensitive and hence individuals must be taught how to use the dental floss to prevent harm of the gingiva. Powered flossing has come into existence to help and provide ease of flossing. Shibly *et al.* in 2001 conducted a study and compared manual dental floss to the powered flossing and concluded that there was equally good with both manual and powered flossing techniques.^[13]

XII. Interdental Brush

Introduced in the 1960's, they replaced wooden sticks with the interdental brushes. Soft nylon filaments are twisted onto fine stainless steel wire. Plastic coated metal wires are also in existence. They are conical or cylindrical in shape. Appropriate interdental brushes are currently available for the smallest to the largest interdental space which ranges from 1.9 to 14 mm in diameter. It is made use of in large embrasure spaces in a back and forth motion.^[14]

XIII. Oral irrigation devices

An oral irrigator is a power driven mechanical device which flushes water in a pulsating stream with a controlled pressure. It is used to remove interdental or subgingivally present plaque biofilm on the tooth surface. Chemical agents such as chlorhexidine, iodine, stannous fluoride or pharmaceutical agents such as 5% tetracycline hydrochloride can be used in the irrigator⁴. Waterpik is an example of an oral irrigator device. The Water Flosser's mechanisms of action are centralized to its effectiveness. Pulsation and pressure are the key water bossing actions. This action disrupts the bacterial activity expels the subgingival bacteria and removal of food debris. Clinical effectiveness has been demonstrated in the 50–90 psi (pounds of pressure per square inch) range. These levels reject what both healthy and inflamed tissues can comfortably handle without tissue damage.^[15,16]

XIV. Efficacy of mechanical plaque control

Efficacy of inter-dental mechanical plaque control in managing gingivitis – a meta-review by SALZER *et al.*, 2015 concluded stating evidence suggested that inter-dental cleaning with interdental brushes is the most effective method for inter-dental plaque removal. Most available studies fail to demonstrate that flossing is generally effective in plaque removal. All investigated devices for inter-dental self-care seem to support the management of gingivitis, however, to a varying extent.^[17]

A systematic review of the effectiveness of self-performed mechanical plaque removal in adults with gingivitis using a manual toothbrush by G. A. Van Der Weijden, 2005 concluded

that in adults with gingivitis the quality of self-performed mechanical plaque removal is not sufficiently effective and should be improved. Based on studies 6 months of duration, it appears that a single oral hygiene instruction, describing the use of a mechanical toothbrush, in addition to a single professional ‘oral prophylaxis’ provided at baseline, had a significant, albeit small, positive effect on the reduction of gingivitis.^[18]

De la Rosa et al 1979 studied the patterns of plaque accumulation and removal with daily toothbrushing over a 28-day period following dental prophylaxis. On average, approximately 60% of the plaque remained after self-performed brushing.^[19]

The new generation of electric brushes has better plaque removal efficacy and gingival inflammation control on the proximal tooth surfaces (Egelberg&Claffey 1998).^[20]

XV. Conclusion

\Mechanical plaque control is the gold standard for maintaining optimum oral hygiene in every individual. The dentists and patients have an equal role to play in hindering plaque buildup on the teeth by using the right methods to brush, floss and also make use of the right mechanical aids for each area or the tooth. The ever evolving technology proves to be promising in enhancing the mechanical plaque control aids.

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