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## Supragingival plaque control, what does it mean?



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One explanation for the conflicting results about the effects of supragingival plaque control on the subgingival microflora is that professional and personal plaque control is not strictly limited to the supragingival environment. When aimed at treating periodontal diseases, these procedures are correctly applied. However, for research purposes, in order to prevent misinterpretation, it is necessary to provide a better explanation about the materials and methods that were used to avoid changes in the subgingival microbiota, both in professional and in home-care supragingival plaque control.

### ■ Introduction

An inter-relationship between microorganisms and gingival inflammation has been detected since the first experimental short-term clinical studies were carried out<sup>1,2</sup>, and substantial efforts have been directed toward minimising the effects of the oral microbiota on the periodontium. On a clean root surface, the microorganisms quickly colonise the teeth following cessation of all oral hygiene procedures, and within a few days microscopic and clinical signs of gingival inflammation become apparent<sup>3-5</sup>. These inflammatory changes can be reversed when adequate tooth cleaning methods are resumed, which therefore shows clear proof that bacteria are involved in the initiation of gingivitis<sup>6-10</sup>.

According to its location, above or below the gingival margin, bacteria that accumulate on the root surface are classified as either supra or subgingival plaque. The first deposit to form on the teeth is a supragingival plaque. Plaque-forming bacteria create an environment that allows the establishment of a

more fastidious microbiota. It is widely assumed that the development of subgingival plaque depends on the presence of supragingival plaque<sup>11-14</sup>, and that its prevention and control are critical to the treatment outcome. Clinical trials have shown the importance of supragingival plaque control in the treatment of gingivitis and recurrent periodontitis<sup>15-19</sup>. In a classic long-term study, Axelsson et al<sup>20,21</sup> demonstrated that preventing plaque accumulation through professional and personal techniques was effective in preventing attachment loss over a period of 15 to 30 years. Nevertheless, the success of the treatment is dependent not only on a proper initial treatment, but also on the establishment of a regular professional maintenance system<sup>22-26</sup>.

The reason for having regular professional assistance is because most patients, instead of brushing their teeth regularly, do not clean their teeth well enough to prevent plaque accumulation. In many cases, the problem occurs due to a lack of information about the disease and of dental anatomy, which could make patients less likely to



**Fig 1** An illustrative case demonstrating the use of a dental floss almost reaching the base of the pocket.

access the tooth surface<sup>27</sup>. Despite the efforts that researchers have made to find new approaches to treat and control periodontal disease, self-performed supragingival plaque control, in combination with professional mechanical instrumentation, should still be classified as the 'gold standard' of periodontal care<sup>20-29</sup>.

## ■ Discussion

It seems plausible that the removal of supragingival plaque influences the development and composition of subgingival plaque since, in the presence of supragingival plaque, rapid subgingival recolonisation will occur within a few weeks. However, the effect of supragingival plaque control on the formation of subgingival microbiota remains unresolved. Several reports have shown that supragingival plaque control alone cannot significantly affect subgingival bacteria in deep pockets<sup>12,30-32</sup>. On the other hand, recent studies have been conducted that demonstrate the influence of professional supragingival plaque control on the composition of subgingival microbiota<sup>33-36</sup>. These findings suggest that meticulous supragingival plaque control through mechanical means, limiting plaque removal to the supragingival areas without affecting the subgingival microbiota, can provide clinical and microbiological improvements similar to those obtained with scaling and root planing alone in subjects with moderate to advanced periodontal disease.

The discrepancy in reports may be attributed to differences in experimental design (i.e. methodology), initial pocket depth, frequency and extent of professional tooth cleaning, patient compliance and



**Fig 2** Action of the rubber cup in the supragingival area in so called 'supragingival plaque control'.

the nature and progression of the periodontal disease. Treatment protocols vary from short- to long-term duration, with a number of studies utilising scaling and root planing prior to professional cleaning, while others evaluated the effect of repeated professional supragingival cleaning or self-performed plaque control in pockets varying from moderate to advanced depth. The probing depth of the selected periodontal pockets in the studies that failed to show a significant effect of supragingival plaque control on subgingival microbiota was >6mm. However, the mean probing depths in studies that showed the influence of supragingival plaque control on the composition of supragingival microbiota ranged from 4 to 6mm. Therefore, a more comprehensive evaluation is required in order to understand the principle of professional supragingival plaque control, its action and limits on the root surface area, and its effect on the subgingival environment<sup>27,37</sup>.

Professional tooth cleaning and patient home care can control supragingival plaque, and 1 to 3.5 mm of subgingival plaque can be removed from the teeth surface by using a rubber cup, toothbrush, dental floss and other cleaning aids<sup>27,38-40</sup>. The application of dental floss with pressure against the



tooth surface, moving back and forth, three to five times a day, as recommended by professionals<sup>41-43</sup>, can also reach the subgingival areas from 2 to 3.5 mm (Fig 1). In the same way, due to its shape and composition, the rubber cup can slip into the subgingival area (Fig 2), and therefore supragingival professional plaque control actually removes some subgingival plaque.

Many would argue that a single therapeutic intervention on the subgingival environment is enough to alter the microbial composition of plaque, from that associated with periodontal disease to that associated with periodontal health<sup>44-49</sup>. For example, if the patient has an interproximal probing depth of 4 to 6 mm, then a sample in which the dental floss has reached a subgingival depth of 3.0 mm cannot be taken as reliable because half or more of the pocket microbiota has been reached by the mechanical action of the dental floss. Since many of the subgingival microbiological samples<sup>50-53</sup> are taken in at least one interproximal area, the results can be incorrectly interpreted due to the fact that they are being mechanically altered by either personal or professional plaque control methods. This leads to the question: how can the mechanical disruption of the subgingival area be avoided in future studies?

One of the answers would be that researchers avoid invading the subgingival environment for plaque control, and also that patients in studies stop any kind of oral hygiene that could affect the subgingival area. This would be possible in short-term studies, but not feasible in long-term studies for ethical reasons. The fact is that the description of the materials used in supragingival plaque control and the care methods used to avoid contamination of subgingival samples is often not clearly explained. Most articles simply describe supragingival plaque removal by mentioning using scalers and polishing the teeth with mechanically driven instruments such as rubber cups and dental floss for interproximal surfaces, and limiting plaque control to the supragingival area. There is no reference concerning the oral hygiene methods applied by patients at home and the ways to avoid invading the subgingival environment.

The invasion of the subgingival area, in order to remove or alter the subgingival microbiota, with the purpose of controlling or clinically preventing periodontal disease, must be encouraged among pro-

fessionals. Therefore, those scientific studies performed to analyse the influence of supragingival plaque on the composition of the subgingival microbiota, should present a better description of the materials and methods used in supragingival plaque control and also the means to avoid subgingival plaque sample contamination. Thus, the real influence of supragingival plaque control on subgingival microbiota will only be established after introducing standardised methods for that control, and also through the discovery of ways to avoid subgingival invasion, both by professionals and patients.

## ■ Conclusion

In order to analyse the influence of supragingival plaque control on subgingival microbiota, it is necessary to standardise materials and methods to avoid any misinterpretation of the results.

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