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## Periodontics in general practice: professional plaque control

Henry Greenwell, DMD, JD, MSD; Nabil F. Bissada, DDS, MSD; John W. Wittwer, DDS, MS

*Traditionally the primary emphasis of preventive periodontics was daily patient performed plaque control. Recent studies indicate that frequent professional subgingival toothcleaning is a mandatory treatment for prevention of recurrent periodontitis. Pathogenic subgingival bacterial complexes are disrupted by frequent cleaning and require time to reestablish. Disease progression is prevented if the recall interval does not exceed the time required for reestablishment of a pathogenic plaque. Legally, patients have acquired the duty to comply with the prescribed recall interval. Both the patient and the practitioner will benefit from a preventive program that includes frequent professional subgingival toothcleaning.*

Professional plaque control is not a public health measure, as in the case of fluoride, but it is labor intensive therapy available only to those willing to seek and accept proper dental care. Adult periodontitis affects only 15% to 25% of the population, and management by intensive supportive periodontal therapy is a viable option. An important requirement of such supportive care is the practitioner's recognition of disease recurrence in the patient. Professional plaque control will maintain most properly treated cases of adult periodontitis; patients who continue to progress are candidates for referral to a specialist.

Success of professional plaque control

closely relates to management of the qualitative composition of the plaque microflora. Thorough toothcleaning disrupts the organization and structure of aging, pathogenic plaque. Then fewer, less pathogenic bacteria are left to rebuild the structure necessary for redevelopment of pathogenic components. Before pathogenic bacteria reestablish, professional toothcleaning again interrupts the cycle again before the bacterial can do harm. The concept that specific bacteria cause periodontal disease describes this specific plaque hypothesis. The success of professional plaque control confirms hypothesis as a descriptor of the role of microbial plaque in the pathogenesis of adult periodontitis.

This article reviews the studies not only about established professional plaque control as a recognized standard required for the successful treatment of adult periodontitis, but also studies that explain the rationale for professional plaque control and demonstrate its effectiveness in large populations.

### Posttreatment professional plaque control

Lindhe and others<sup>1</sup> reported that teeth treated by either surgical or nonsurgical methods tend to maintain health as long as optimum plaque control was sustained. After treatment each patient received professional toothcleaning every 2 weeks in the first 6 months. The interval was lengthened to 3 months for the remainder of the 2-year study. Teeth that were plaque-

free maintained attachment levels; plaque-associated sites often lost attachment to the tooth. In contrast, Ramfjord and others<sup>2</sup> reported, in an 8-year study of surgical therapy, that perfect personal plaque control was not critical for the maintenance of attachment levels. Twenty-five percent of the patients with the best plaque scores were compared with 25% of the patients with the lowest plaque scores. No significant differences in attachment level data were found between the two groups over the long-term. The success of the therapy despite imperfect plaque control was attributed to the 2 to 3 month recall for professional toothcleaning.

Pihlstrom and others<sup>3,4</sup> evaluated patients treated surgically and nonsurgically, and they found that even with relatively poor personal supragingival plaque control, attachment levels could be maintained when complying with the recall for professional toothcleaning. This supported the findings of Ramfjord and others,<sup>2</sup> and it created a conflict concerning the role of posttreatment personal plaque control in the maintenance of periodontal attachment levels. Isidor and others<sup>5,6</sup> resolved this conflict in a 5-year study of patients treated surgically and nonsurgically for periodontal disease. They found that oral hygiene status did not correlate with the number of deteriorating sites, confirming the findings of Ramfjord and others<sup>2</sup> and Pihlstrom and others.<sup>3,4</sup> The results of previous studies did not actually conflict but merely reflected the use of different types of professional toothcleaning.



Lindhe and others<sup>1</sup> performed professional supragingival toothcleaning alone while Ramfjord and others,<sup>2</sup> Pihlstrom and others,<sup>3,4</sup> and Isidor and others<sup>5,6</sup> also included professional subgingival toothcleaning. Thus professional subgingival toothcleaning prevented significant attachment loss even when personal oral hygiene was imperfect; professional supragingival toothcleaning did not prevent attachment loss if personal plaque control was imperfect.

The 3-month recall for professional supra- and subgingival tooth cleaning appears to maintain periodontal health. The nonspecific plaque hypothesis calls for pocket elimination to expose all areas of the tooth subject to plaque accumulation in periodontal treatment. Subgingival plaque is rendered supragingival and accessible to the patient for complete daily removal that accommodates the most fundamental tenet of the nonspecific plaque hypothesis: all plaque must be removed to prevent dental diseases. Lindhe and others<sup>1</sup> demonstrated that loss of periodontal attachment can be expected with imperfect supragingival plaque control. Few patients can maintain ideal standards of plaque control and the nonspecific plaque hypothesis fails as a practical rationale for pocket elimination surgery. On the other hand, periodontal treatment based on the specific plaque hypothesis permits the presence of nonpathogenic plaque which does not provoke loss of clinical attachment. The specific plaque hypothesis is clear: it is the qualitative composition of the plaque, not its presence, that is harmful. Pathogenic plaque harbors either bacteria or bacterial complexes that predispose to loss of attachment. The flora that causes disease progression may vary from individual to individual; it is specific in that it is pathogenic and not necessarily because of equivalent bacterial composition. The professional subgingival plaque control performed by Ramfjord and others,<sup>2</sup> Pihlstrom and others,<sup>3,4</sup> and Isidor and others<sup>5,6</sup> did prevent loss of attachment, even when personal supragingival plaque control was imperfect.<sup>2,4</sup> Interrupting the development of a pathogenic flora, illustrates the specific plaque hypothesis as the primary rationale for using professional subgingival plaque control as a method to preserve periodontal health in supportive therapy. Maintaining qualitative control of the flora by converting a pathogenic subgingival plaque to a temporarily nonpathogenic state is an essential component of the specific plaque

hypothesis.

The foregoing studies do not support neglect of oral hygiene procedures; all patients were on a closely supervised personal plaque control program and were evaluated at frequent intervals by a periodontist. While patients' plaque control was often far from perfect, there were no cases of gross neglect. Three points need to be recognized and emphasized: many patients will fall short of the goal of perfect plaque control; frequent professional supra- and subgingival plaque control is an ironclad, inflexible requirement for long-term supportive care; and in the absence of professional subgingival plaque control, loss of attachment and ultimate failure of the case should be expected. Although not all patients or all sites within the mouth are susceptible to breakdown, we cannot predict which ones will break down. Therefore, these principles should be applied to all patients with periodontitis, whether the disease is considered active or inactive.

#### Rationale for professional subgingival plaque control

Listgarten and Hellden<sup>7</sup> reported that the bacterial morphotype proportions in the subgingival microflora were different in health and disease. Periodontally healthy sites were predominated by coccoid cells and straight rods; diseased sites had increased proportions of motile rods and spirochetes.<sup>7</sup> When diseased sites were treated by scaling and root planing, the flora composed of motile rods and spirochetes was converted to a coccoid cell and straight rod flora in healthy mouths.<sup>8</sup> It took approximately 42 days for spirochetes to return to baseline (pretreatment) levels. *6 week then up*

The posttreatment shift in subgingival morphotype proportions from disease associated to health associated bacteria followed by a slow return to pretreatment levels was termed by Greenwell and Bissada<sup>9</sup> as the "baseline tendency effect." Disease-associated morphotypes are not necessarily periodontal pathogens. Presumably pathogenic components of the subgingival microflora follow the same repopulation trends as morphotype proportions, accounting for the association with disease. Pathogenic bacteria reestablishes in approximately 3 months.<sup>14</sup> Morphotypes may return to pretreatment levels in 42 days; however, the role of disease associated morphotypes must not be misinterpreted and equated with the

role of specific bacteria identified as periodontal pathogens. The return time of pathogenic complexes, capable of inducing attachment loss, cannot be identified from morphotype counts using phase contrast or darkfield microscopy. The morphotype examination is valuable as a research tool and illustrates the trends of microbial succession, the direction of the qualitative shift toward either health associated or disease associated bacteria. The qualitative shift toward a health associated flora is critically important to the success of the 3-month recall.

Listgarten and others<sup>10</sup> compared the clinical and microbiological effect of SC/RP with systemic tetracycline, 1 g per day for two periods of 2 weeks separated by a 1 month interval. The effect of SC/RP was equivalent to the antibiotic therapy in terms of producing a shift in subgingival morphotypes. This demonstrates the powerful effect of professional subgingival toothcleaning in producing qualitative bacterial changes. The distinction between the two therapies was the antibiotic's short lived effect on the bacteria if it was not accompanied with SC/RP.

Professional subgingival plaque control is the most important aspect of a supportive care plaque control program, in conjunction with patient-performed supragingival plaque control. Magnusson and others<sup>11</sup> reported that patients with poor supragingival plaque control typically show a rapid return of spirochetes and motile rods to baseline levels. Patients with excellent supragingival plaque control benefit from a sustained reduction of spirochetes and motile rods. The time required for the baseline tendency effect to cycle varies, depending on the patients' level of supragingival plaque control. Good oral hygiene results in a prolonged return to baseline (disease associated) values while poor oral hygiene yields a rapid return. The frequency of the recall may depend on the level of supragingival plaque control. Patients with poor supragingival plaque control may require a shorter interval than the standard 3-month period. At some point, shortening the recall interval becomes impractical.

The initial development of subgingival plaque most likely derives from supragingival plaque. Yet, Tabita and others<sup>12</sup> demonstrate that even daily professional removal of supragingival plaque will not prevent the reformation of subgingival plaque. This is possibly the result of the inability to achieve total plaque removal consistently. Even professional supragin-



gival and subgingival toothcleaning cannot halt subgingival plaque growth. The fact that subgingival plaque formation cannot be prevented explains why recall for professional subgingival cleaning is essential for all patients with periodontitis.<sup>1</sup>

### Professional plaque control and large populations

In a 6-year study on the effect of professional plaque control on adult dental health, Axelsson and Lindhe<sup>13,14</sup> evaluated two different systems of dental care: traditional, symptomatic care versus a preventive care program. The traditional care group (375 subjects) received SC/RP, treatment of all carious lesions including replacement of ill-fitting restorations, and one session of oral hygiene instructions followed by 1-year recall with accompanying symptomatic dental treatment. The preventive care group (180 subjects) received the same initial SC/RP and caries treatment; however, this was followed by 2-month recall in the first 2 years and 3-month recall in the last 4 years. Each patient-recall for professional supra- and subgingival toothcleaning also included detailed oral hygiene instructions. Results show that traditional dental care does not halt the progression of caries and periodontal disease. Preventive care with frequent professional toothcleaning motivates individuals to adopt proper oral hygiene habits, resolves gingivitis, and prevents the progression of caries and periodontal disease.

Axelsson and Lindhe<sup>13,14</sup> applied the 3-month recall program to the general population with overwhelming success, not only in the prevention of periodontal disease but also dental caries. The frequent professional toothcleaning and oral hygiene instruction also serves as motivational therapy and stimulates patients to exercise good oral hygiene habits. Frequent, thorough toothcleaning keeps the teeth largely calculus-free which simplifies and facilitates personal oral hygiene efforts.

In an evaluation of an even larger population Loe and others<sup>15-18</sup> compared the periodontal health of subjects receiving a high level of dental care to a group receiving minimal care. A total of 565 Norwegian students and academicians represented the upper socioeconomic strata, receiving a high level of dental care, and the group with deprived economic conditions and minimal dental care was made up of 480 Sri Lankan tea laborers.

At the last report, the group receiving a high level of dental care had only little loss of periodontal attachment and a very low tooth mortality rate. In contrast, the Sri Lankans receiving minimal dental care exhibited significant loss of periodontal attachment and a much higher rate of tooth mortality.

Two studies in the United States reveal a dramatic decline in prevalence of periodontitis. In 1955 Marshall-Day and others report that 88% to 92% of a group aged 40-60 had periodontal disease and pockets.<sup>19</sup> A 1987 report by Miller and others<sup>20</sup> evaluating 20,818 individuals from across the United States based conclusions on both loss of attachment and probing pocket depths. It shows only 15% to 25% of the population with significant pocketing or attachment loss. While the two studies use different methodology and are not directly comparable, it is clear that periodontitis has declined in the United States. Some of the factors contributing to this decline include: the high level of dental care provided by the average US practitioner, patient education and awareness of the importance of oral hygiene and regular dental care, and frequent media advertisements of oral hygiene products, which accentuate the social unacceptability of poor oral hygiene and oral malodor. With more frequent professional toothcleaning and preventive care, prevalence of periodontitis will decline even further.

### Disease progression and professional plaque control

The previously discussed studies by Axelsson and Lindhe<sup>13,14</sup> have shown that 3-month professional toothcleaning is beneficial for the population at large; and therefore, it could be a useful option for any patient in need of improved preventive care. Patients who have been diagnosed and treated for adult periodontitis, however, require 3-month professional toothcleaning to prevent continued progression of disease. Greenwell and others<sup>21</sup> have proposed a method of diagnosis for treated periodontitis, termed a response diagnosis, to help identify the current disease status of individuals treated for adult periodontitis at each 3-month recall visit. Patients who have no further progression of disease were diagnosed as having controlled periodontitis and need no additional therapy beyond the 3-month recall. Those who continue to lose attachment despite proper treatment and 3-month profes-

sional toothcleaning were diagnosed as having either advancing periodontitis, uncontrolled periodontitis, refractory periodontitis, or nonresponding periodontitis. These patients may need more frequent professional toothcleaning or other sophisticated diagnostic testing and treatment, and they are candidates for referral to a specialist. This method of diagnosis will help avoid lawsuits for failure to diagnose periodontal disease or supervised neglect.

### Compliance with professional plaque control

Studies of compliance with a 3-month recall interval following treatment by a periodontist show wide variation. Wilson and others<sup>22</sup> reported that only 16% of patients complied with the recommended interval; Schmidt and others<sup>23</sup> found 95% compliance. The reason for the difference is not clear. As with oral hygiene, motivation is undoubtedly an important factor. Patients should be informed before periodontal therapy that frequent professional toothcleaning is a requirement for successful treatment and failure to comply will most likely yield a poor treatment result. Schmidt and others<sup>23</sup> found that erratic compliers required more surgical treatment than patients in full compliance with the recommended interval. Compliance was good for patients who alternated recall between the periodontist and general dentist and this system was effective in maintaining excellent periodontal health in supportive therapy.

### Professional toothcleaning procedures

It is important to make the distinction between the three different types of professional toothcleaning procedures: routine prophylaxis, SC/RP, and professional subgingival plaque control in a 3-month recall for supportive periodontal therapy. Routine prophylaxis is primarily a supragingival procedure provided for patients who are periodontally healthy or have mild gingivitis. All plaque, calculus, and stain are removed and since there is no pathologic deepening of the sulcus this procedure is often accomplished in 30-45 minutes. Subgingival areas may be cleaned but since the sulcus is 3 mm or less this can be achieved with little difficulty. As with other professional toothcleaning procedures, complete plaque removal is equally as important as complete calculus removal.



The SC/RP procedure is generally reserved for patients who have not had recent active treatment for periodontitis (root instrumentation) and typically exhibit deposits of older calculus that are tightly attached to the root surface. Removal of these tenacious deposits requires sharp, new curets that can withstand the lateral forces required for complete calculus removal. Older curets, thinned by sharpening, are subject to fracture. A very sharp curets blade is needed to remove the superficial layer of cementum which contains endotoxins, perpetuators of the inflammatory process.<sup>24,25</sup> Ultrasonic instrumentation is helpful and often used before root planing.<sup>26</sup> SC/RP may require up to 2 hours per quadrant with local anesthesia if the procedure is performed in accordance with the principles of nonsurgical periodontal therapy.<sup>27,28</sup> As SC/RP is a difficult procedure, calculus is frequently missed; therefore, patients must be reevaluated after SC/RP so that all areas of missed calculus can be detected and removed.<sup>29,31</sup>

Recall for treated periodontal patients is a completely different situation. Residual pockets, usually shallow, may be present to complicate the toothcleaning procedure. Since the tissue is healthy and tightly adapted to the tooth, older, thinner curets may be easier to use and more comfortable for the patient. Anesthesia is not required and the appointment, complete with periodontal examination, can usually be accomplished in 1 hour. Deposits on the teeth are immature and easier to remove than older, more tightly attached calculus. Removal of root cementum and/or dentin is not a goal of the recall appointment as it is with SC/RP. In fact, continued planing of the root surface would be an abusive procedure resulting in excessive and unnecessary removal of tooth structure. The critical factor is that all plaque and calculus must be removed. Total plaque removal is an often overlooked requirement of this appointment but in terms of producing a prolonged baseline tendency effect this is a critically important objective. The subgingival tooth surface should be curetted until no more visible soft deposits can be withdrawn. Supragingivally, the proximal tooth surfaces should be flossed until plaque free, then all buccal and lingual plaque removed by rubber cup polishing. The thoroughness of the toothcleaning is important since incomplete plaque removal will result in a shortened cycle for the baseline tendency effect and fuel an earlier return of pathogenic bacteria.

### Legal ramifications

Inadequate patient performed plaque control was considered the primary cause of case failure in periodontal maintenance therapy when the treatment rationale was based on the nonspecific plaque hypothesis. The goal of treatment was to create a situation whereby all plaque could be removed by the patient on a daily basis. If the patient failed to comply this duty, the resulting periodontal deterioration was attributed to patient neglect. The professional's duty was to provide 6-month recall for examination, toothcleaning, and oral hygiene instructions to support conditions that would permit the patient to maintain periodontal health through personal oral hygiene measures. Negligence arising from periodontal maintenance therapy based on the nonspecific plaque hypothesis was usually attributable to the patient because any failure of daily plaque control could lead to disease recurrence.

The recent World Workshop in Clinical Periodontics rejected the term "periodontal maintenance therapy" in favor of the more descriptive "supportive periodontal therapy" (SPT).<sup>32</sup> A recall appointment should include complete periodontal examination, response diagnosis, professional supra- and subgingival toothcleaning, and recommendations for any additional treatment. From a legal standpoint, both the patient and the practitioner have acquired new duties. The professional is obligated to inform the patient that professional plaque control is necessary on a 2 to 3 month basis and to provide proper professional toothcleaning, examination, and diagnosis. Providing periodontal treatment without accompanying SPT should be considered negligent care by the practitioner. The patient retains the previous duty to perform adequate personal plaque control and acquires the duty of complying with the prescribed interval for professional plaque control. Failure of the patient to comply with these duties will result in disease progression, which the professional will be powerless to prevent.

Studies by Axelsson and Lindhe<sup>33,34</sup> show that 3-month professional toothcleaning may be beneficial for the general population as a preventive measure. There is a duty here to inform patients without periodontitis that this is a treatment option. Patients with periodontitis, however, must be informed that 3-month professional toothcleaning is a mandatory component of successful treatment.

Irrespective of the type of therapy, elective or required, the patient needs to be informed of the role of that treatment in establishing and/or maintaining their periodontal health. If the practitioner's recommendations are rejected, a written "informed refusal" should be obtained to ensure that the patient understands the consequences of their refusal and to protect the dentist in case of future litigation.

### Summary

Studies of treatment of adult periodontitis followed by professional plaque control have shown that complete supra- and subgingival plaque and calculus removal on a 3-month basis is needed to prevent additional loss of periodontal attachment. The success of the procedure is dependent on maintaining control of the qualitative composition of the subgingival flora. This is accomplished by subgingival toothcleaning which disrupts established plaque structure, delays the reestablishment of periodontal pathogens, and produces a baseline tendency effect. Large populations that have a high level of dental care have less disease progression than those with minimal care. For patients with adult periodontitis, supportive 3-month recall is not an option—but a requirement for successful therapy. These patients need a response diagnosis to document the current disease status at each recall visit and to identify the need for additional treatment. Those that exhibit disease progression are candidates for referral to a specialist. The procedure used for professional subgingival plaque control is vastly different than the scaling and root planing procedure. The thoroughness of plaque removal in the recall appointment is critically important and may increase for the time the baseline tendency effect to complete its cycle.

### JADA

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Dr. Greenwell is assistant professor, and Dr. Wittwer is professor of periodontics, University of Louisville; Dr. Bissada is professor and chairman, department of periodontics, School of Dentistry, Case Western Reserve University, 2123 Abington Rd., Cleveland, 44106. Address requests for reprints to Dr. Bissada.



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