Maintenance care and supportive periodontal therapy

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This paper presents a review of the literature and clinical observations concerning the long-term professional care of all dental patients. Gingivitis, ubiquitous in the adult population, is often without significant consequences to the dentition; however, gingivitis may develop into periodontitis. Patients with gingivitis, therefore, should be monitored professionally, especially those patients with other risk factors (attachment loss, age, smoking, and abnormal tooth mobility). In patients without substantial attachment loss, professional examination, prophylaxis, and oral hygiene instruction should be provided once or twice a year, depending on the presence of other risk factors. All patients who have been treated for periodontitis should be recalled, after completion of treatment and a healing phase, every 3 to 4 months. Sites with active periodontitis should be re-treated. Topical use of fluorides is recommended.
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Introduction

The goal of periodontal treatment is to maintain the natural dentition in functional health and comfort throughout the lifetime. This ideal, lofty goal often is not completely met in clinical practice, because it requires perfect plaque control, which is seldom achieved. Without some artificial (mechanical and/or chemical) prevention or periodic removal of plaque, every adult will develop some evidence of gingivitis.[1] Thus, health maintenance care is needed for everybody. No known diet has been proven to eliminate the need for artificial oral hygiene to prevent gingivitis[2]; even rigorous oral hygiene cannot totally eliminate gingivitis in sizable, randomized population groups. In some individuals, manifestations of gingivitis may have minimal or no effect on functional comfort and longevity of the dentition,[3] and gingivitis often can be diagnosed only by a professional examiner.

The question is, therefore, to what extent should professional maintenance care be concerned with the treatment and prevention of gingivitis? It is well known that periodontitis develops from gingivitis, but at present there is no test that will predict reliably which patients with gingivitis will develop periodontitis and at what location. Neither is the progression rate of attachment loss predictable. However, manifestations of gingivitis should be taken seriously for several compelling reasons:

1. Gingivitis is a form of disease, a deviation from the state of health.
2. Gingivitis may develop into periodontitis with loss of attachment, but not always.[4]
3. The less evidence of gingivitis, the less severe is the loss of periodontal attachment over time.[5,6]
4. The only known way to prevent periodontitis is to control gingivitis with professional and personal plaque control.
5. Gingivitis is a greater threat to loss of attachment in persons who already have lost some attachment than it is in persons who have no attachment loss.[4]

Natural history of periodontal disease

Longitudinal studies of populations without and with treatment of periodontal disease have provided much

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information on the nature of periodontal disease, with regard to both gingivitis and periodontitis.[4,6-8] Longitudinal studies by Löe and coworkers,[4,7] in both Sri Lanka and Norway, have documented that plaque, calculus, and gingivitis are common conditions. These conditions often lead to a slow loss of periodontal attachment with increasing age (approximately 0.1 mm per year in Norway and 0.3 mm per year in Sri Lanka). Further analysis of the data identified three distinct patterns of attachment loss in patients who received no periodontal therapy: no loss in 11%, moderate loss in 81%, and rapid loss in 8%.[4] No differences in oral hygiene and manifestations of gingivitis were found among these three groups. In the Norwegian group that had superb professional and personal control of oral hygiene, no rapid progressive loss of attachment was observed, only a very slowly progressing loss with age.

In a unique, well-controlled American study of a balanced sample, measurements and scores from the same individuals over an interval of 28 years were compared.[8] Of this sample, 13% had an average increased loss of 2 mm or more per person, while 60% maintained the same attachment levels ($\pm$ 1 mm) over the 28 years. The risk for great loss of attachment was associated with age, smoking, and abnormal tooth mobility. At the time of the last examination, there also was a weak correlation between loss of attachment and high levels of gingivitis, plaque, calculus, low education level, and irregular dental attendance. Only 13.4% of the measured sites lost 3 mm or more of attachment over the 28 years. However, about 11% of the teeth present at baseline were lost over the 28 years. There is no record of why these teeth were lost; periodontal disease may have been responsible for part of this loss but the teeth may not have been recorded as teeth with severe loss of attachment.

It thus appears that the risk for severe loss of periodontal attachment is limited to 10% to 15% of the adult population. Contributing significantly to that risk are factors such as advanced age, smoking, abnormal tooth mobility, and oral hygiene habits.[8] Even without any dental care, about 10% of the adult population is immune to significant loss of attachment. With average dental care (once or twice a year) 60% of the adult population essentially maintains adequate periodontal support for the teeth. A significant loss of attachment may occur in 10% to 30% of the adult population, influenced by factors such as age, smoking, tooth mobility, oral hygiene, and adequacy of dental care.[8]

The challenge is to reach this risk group at as early an age as possible with adequate dental care. Studies have demonstrated that significant loss of attachment may be prevented for practically everybody through hygiene measures.[6,7] Although complete elimination of gingivitis and plaque is not required, the results improve for maintenance of attachment when plaque and gingivitis scores are reduced.[6]

Who are the at-risk patients?

To determine the need for frequent professional periodontal care, it is important to determine which patients are at risk for significant loss of attachment without such care. At present no test is available to determine if and when gingivitis may develop into periodontitis with loss of attachment.[9] Patients with systemic diseases, such as diabetes and agranulocytosis, require special consideration and are not included in this discussion.

Clinical evidence indicates that persons who have lost some attachment are more vulnerable to further and faster loss of attachment than are persons with no such loss.[4,7] Other risk factors are age, smoking, increased tooth mobility, and poor oral hygiene,[8] although some individuals have very low loss of attachment despite the presence of these risk factors.

It is essential to diagnose and treat the persons who are at risk for future loss of attachment. These are the patients who already have lost a significant amount (2 mm or more) of periodontal attachment and exhibit some of the other risk factors (advanced age, smoking, increased tooth mobility, and poor oral hygiene). Of these factors, previous loss of attachment is by far the most important, and can be diagnosed only by professional examination, which should be carried out at least once a year. Significant loss of attachment should indicate the need for supportive periodontal therapy (SPT).

For patients who have gingivitis but no significant loss of attachment and no interference with their normal life-style, there does not appear to be any reason for professional cleaning of the teeth more than once a year, according to a recent well-controlled investigation by Eneroth and Sundberg[10] in a large Swedish population sample. Their study included adults without significant periodontitis. All patients received regular dental care, including prophylaxis, when the study started. Then one group was given a professional tooth cleaning every month, another group was recalled every 2 months, and a third group was re-

called every 12 months for 5 years. A few patients who developed periodontitis were withdrawn from the study for extra care. Professional tooth cleaning with oral hygiene instruction once a month was not more effective in controlling gingivitis and caries than was recall once a year. The attachment levels were unchanged for all of these patients, while gingivitis was not prevented totally even by monthly recalls and instruction. It appears from this study that no benefit is gained by providing professional care more than once a year in a population essentially without periodontitis. The important consideration is to discover when gingivitis develops into periodontitis, and then immediately introduce care. It could be argued that such professional examination ought to be twice a year instead of once; however, the correctness of this assumption is not known. It can be concluded that *(1)* every adult should have a professional examination and tooth cleaning at least once a year, and *(2)* a person who has lost a significant amount (more than 2 mm) of periodontal attachment is in a risk group and needs periodontal treatment followed by SPT.

Supportive periodontal therapy

Periodontitis if left untreated is a progressive disease.[7,11] The progressive loss of attachment is greater for deep pockets than for shallow pockets,[12] and greater with other risk factors (age, smoking, tooth mobility, and poor plaque control). The progress of periodontal destruction can be halted to a major extent by a number of treatment modalities and SPT.[13–15] Even adverse risk factors may be negated by periodic professional care.[16] When SPT was provided, there were no significant differences in pocket depth, attachment levels, gingivitis, or plaque between smokers and nonsmokers over 8 years.[16]

It appears that the requirements for SPT are basically the same regardless if "pocket elimination" is attempted or not during the therapy.[17,18] A few patients may lose attachment in a few teeth in spite of all tested methods of SPT.[6] The main influence appears to be unfavorable immune response, rather than the past treatment of probable crevicular depths,[17] and some local risk factors, such as inaccessible exposed furcations.[15] Precautions against failure include eliminating risk factors and making furcation accessible for periodic plaque removal—all within practical limits, because extensive splinting of teeth may eliminate mobility, but introduce cost and maintenance problems greater than the nonincreasing mobility.

Healing phase

It has been proposed by Westfelt et al[19] that 6 months be allowed after periodontal therapy as a healing phase. Others have recommended that the maintenance phase begin 12 months postoperatively,[13] although there are obvious adaptive changes of gingival contour over several years, influenced by the modality of the therapy. The postoperative attachment levels are established fairly well 6 months postoperatively,[19] while gingival contour and crevicular depth change over a much longer time span. It is also well documented that oral hygiene, professional and personal, is of great importance during this healing phase.[13,19] Oral hygiene may be less important for the long-term maintenance of the attachment levels with controlled maintenance care.[20] Thus, SPT usually is considered after healing maintenance care is provided for 6 to 12 months postoperatively; after mucogingival surgery, the position of the free gingival margin usually is stable from 4 to 6 weeks postoperatively.[21]

While personal plaque control always has been stressed, professional care during the healing phase has varied in some studies, from professional tooth cleaning every 2 weeks[19] for 6 months, use of chlorhexidine, or recall every week for 4 weeks postoperatively followed by recall every 3 months.[16] It appears (without documented evidence) that these methods have been equally beneficial for postoperative healing, and that meticulous plaque control postoperatively is essential for optimal healing. However, the main purpose of the present paper is to focus on the long-term care over several years following periodontal therapy.

Objectives

The main objective of SPT is to support the results of the initial therapy through a periodic professional recall system and maintenance of optimal plaque control, supragingivally and subgingivally, as well as to discover and remove irritants that were not eliminated during the treatment and healing phase.

If the initial treatment succeeds in elimination of all causative and risk factors, and the subsequent oral hygiene is optimal, there apparently is not any need for SPT, according to an animal study.[22] However, in clinical practice there is an overwhelming risk that neither the initial treatment[23,24] nor the subsequent personal oral hygiene will be perfect for every tooth for every treated periodontitis patient.[20] Thus, SPT is indicated for every periodontitis patient with signifi-

cant (2 mm or more) loss of attachment. The previous loss of attachment indicates that these patients are at risk for further loss.

The present great interest in recall systems developed after Axelsson and Lindhe's[25] spectacular success in prevention of caries and gingivitis by periodic professional tooth cleaning in patients at high risk of caries and gingivitis, Nyman and coworkers[18,26] documented the decisive value of a structured periodic recall program following periodontal surgery, and Ramfjord et al[27] had published results of a program of professional tooth cleaning every 3 months for treated patients. A well-controlled periodic recall program is especially significant for optimal healing following periodontal surgery,[19] but will also influence the maintenance of clinical periodontal attachment for years after the initial therapy.[6] The superiority of a program that recalls patients every 2 to 3 months compared to once or twice a year has been well documented by Axelsson and Lindhe.[6,28,29] Among patients treated for moderate to advanced periodontitis, it has been shown that the loss of periodontal attachment occurs at a faster rate in those who fail to appear for recall programs than in patients who comply.[30-33] Furthermore, surgical periodontal treatment without an adequate recall program may be worse than no treatment at all, regardless of type of surgical therapy.[18]

The most successful longitudinal studies of periodontal therapy over several years indicate that recall for professional tooth cleaning (supragingivally and subgingivally) every 3 to 4 months supplemented by re-treatment of a few teeth[15] has provided results superior to those of less frequent recalls.[28] Sliding scale recalls based on bacteriology of the pocket have been suggested,[34] but without favorable long-term results.[9]

Recall program

An acceptable recall program for patients who have been treated for periodontitis should include:

1. Assessment of health status (systemic and oral)
2. Education of the patient
3. Removal of plaque and calculus
4. Application of fluoride
5. Consideration of drugs
6. Re-treatment where indicated

Assessment of health. After a brief medical and dental history is taken, the mouth should be examined for soft tissue lesions, caries, and periodontal status with emphasis on previously recorded problem areas. Teeth with bleeding or pus from the bottom of the crevices and obvious deepening of pockets should be identified.

Education of the patient. After a disclosing solution is applied, plaque and gingival inflammation are shown to the patient in a mirror. Efficient tooth brushing and flossing for improvement of gingival health is demonstrated in a few areas. This is done in a factual, nonreproaching way. It is explained to the patient that, because there have been some problems with plaque removal, the accretions will be removed to prevent deepening of the gingival crevice. Do not waste time on reeducation unless the patient has forgotten how to brush and floss. Patients are more likely to come back for the next appointment if embarrassing scoldings are avoided. Patient motivation may be effective during the initial therapy, but there is a diminishing return from reeducation at maintenance appointments.[20] The patient may perceive of the scolding as "nagging" and may become reluctant to return for future sessions. Education should be friendly and positive.

Removal of plaque and calculus. Numerous studies have established that removal of plaque and calcified deposits should include both supragingival and subgingival accretions.[35,36] Elimination of supragingival calculus and plaque alone may not stop the progress of periodontitis.[35,36] Maintenance care without removal of subgingival plaque will prevent periodontal destruction only if the patient's oral hygiene has been perfect.[14] It has been demonstrated in animals that with perfect plaque control there is no need for professional maintenance care.[22] With removal of supragingival accretions every 3 months, however, the attachment level can be maintained even if the patient's plaque control is less than perfect.[20]

There have also been some questions about the need for repeated root planing during recall visits. In early longitudinal studies, root planing was included in the recall routine, and root deformities and sensitivity sometimes occurred.[27] Later, root planing during recall visits was done only in association with re-treatment of rough, plaque-retaining surfaces. The need for root planing has been markedly reduced by use of topical fluorides to avoid initial carious softening of the root surfaces.

To avoid overtreatment of the root surfaces, plaque and soft calculus are first removed by polishing with a fluoride-containing toothpaste. With a polishing contra-angle and a soft rubber cup, the polishing is

extended as far as possible subgingivally. Scaling is only done to remove accretions not removed by the polishing. The so-called toxic effect of cementum under plaque following plaque removal on previously root planed surfaces is unsubstantiated.

Ultrasonic scalers or air-powder abrasives should not be used on root surfaces for routine recall care. The results after prolonged use may be rough, sensitive roots. Curettes should not be forced into non-bleeding healed pockets.

Application of topical fluoride.

Consideration of drugs. The use of drugs for SPT will be discussed later in this paper.

Re-treatment where indicated. Those pockets with overt bleeding and/or deepening are scheduled for re-treatment within 2 to 3 weeks. The re-treatment should be done by the dentist. A routine recall visit should take about 30 to 45 minutes.[6]

Re-treatment

In spite of elaborate recall systems, some teeth have lost attachment and a few teeth have been lost during all longitudinal clinical trials of periodontal therapy involving moderate to advanced periodontitis. When examined after extraction, all of the teeth lost in one longitudinal study had gross residual calculus, mostly in inaccessible furaction areas, and the lost teeth were most often molars with furcation involvement.[15] Similar observations have been made by other investigators.[37]

Incomplete removal of subgingival accretions as well as root surface defects on roots exposed in pockets are common, even with surgical exposure.[24] However, the fact that the measurable progress of periodontitis is halted in the majority of patients[13] implies that complete elimination of microscopic deposits and defects is not required for acceptable clinical results. Only clinical reactions, such as bleeding on probing, pus, or deepening of the pockets, can indicate if there are unacceptable residual irritants on the root surface. Clinical healing with epithelialization is not complete if there is bleeding on light probing.

In an early longitudinal study, no systematic re-treatment by the periodontist was done beyond the maintenance care provided by the hygienist, and teeth that started to lose attachment lost more at an accelerated rate over time.[13] In a later study re-treatment of teeth with frequent bleeding and evident loss of attachment was done by a periodontist, and in most instances the loss of attachment was halted, except in furcation areas with poor access.[15] The total loss of teeth over time was much less than in the first study, and of 17 teeth lost, all but one had furcation involvement.[15] The need for re-treatment was higher in teeth treated by scaling and root planing than in teeth treated by surgery. However, with re-treatment, the clinical results were as good as or better than the postsurgical results over 5 years.

Re-treatment should be based on an unfavorable response, with bleeding, pus, or loss of attachment indicating active periodontitis. In most instances, a flap has to be raised to provide access to the residual irritants; in a few instances, in furcations, it may not be possible to remove all irritants, even with flap surgery. Fiber-optic light and magnifying loupes may help. Absence of roughness on the root surface in the pocket should not be too reassuring, because that does not preclude the presence of small specks of calculus or root defects.[38]

Use of antibiotics has a tendency to conceal the effects of irritants on the root surface, for up to several months, because the antibiotics may temporarily eliminate the majority of the pathogenic organism and a temporary healing in the pocket wall may occur. However, sooner or later the opportunistic infection[39] related to retention sites will recur unless the retention potential has been removed in the meantime. Thus, when a periodontal abscess has subsided following antibiotic therapy, the root surface should be instrumented thoroughly, with or without flap surgery, within 2 to 3 weeks to prevent reinfection. If the instrumentation is successful in eliminating the irritants, the lesion will heal; if not, it will eventually recur as evidence of nonsuccessful SPT. The use of antibiotics during any stage of periodontal therapy has the confusing effect of concealing for several months the failure to completely remove irritants from the roots (with or without surgery). Thus the dentist may think that periodontal surgery or further root planing is not needed because of the temporary healing. Another reason to avoid full-scale antibiotic treatment of periodontal disease is the risk for development of multiple abscesses in association with only partial elimination of pathogenic organisms.[40]

There are some reports in the literature of supplemental short-term benefit of antibiotics for patients with recalcitrant recurrent periodontitis.[41,42] However, lack of proper control and small number of patients makes it impossible to assess the value of these reports, and the long-term significance is unknown. Prolonged use of antibiotics to prevent recurrence of

periodontitis cannot be recommended because of the risks of development of resistant strains of bacterial flora and allergic reaction. Periodic sulcular irrigation with antiseptics (professional or by the patient) has not proven to be effective for health maintenance in treated periodontal pockets.[43] Prolonged use of nonsteroidal anti-inflammatory drugs[44] cannot be recommended for SPT because of the unfavorable systemic implications.

The clinical results of mechanical periodontal therapy followed by rigid periodic SPT have been reported as excellent,[13] even for as long as 14 years, with the loss of very few teeth.[14] Traditionally, it has been assumed that if the pocket depth could be reduced to less than 3 mm following periodontal therapy, it would facilitate maintenance care and prevent future periodontal loss, and it has been suggested that treated healed pockets with a long junctional epithelium are predisposed to repocketing.[45] These assumptions have been refuted by a recent investigation, which has documented that the resistance to progressive loss of clinical attachment is about the same for long epithelial and connective tissue attachments.[46]

The percentage of loss of clinical periodontal attachment with rigid SPT is about the same for shallow crevices (3 mm or less) as for deeper posttreatment crevices, 1 to 5 years following periodontal therapy,[17] regardless of other risk factors.

Because at the present there is no way to predict risk for loss of attachment, all patients with loss of 2 mm or more of attachment should be considered at risk and given the recommended SPT.

Compliance

Some doubt has been expressed about the practicality of a frequent (three or four times a year) recall program as a routine for treated periodontitis patients in private periodontal practice. In institutional programs with no fee for recalls, the compliance has been good (72 of 90 patients over 5 years,[15] for example). However, in a private periodontal practice,[47] only 16% of the treated patients complied with the suggested recall program over 8 years; in another report,[48] 67.7% of the treated patients were noncompliant after 3 to 7 years. In that study, patients whose recall fees were covered by insurance were more compliant than were uninsured patients.

However, a recent study of 631 patients over 1 to 20 years in a private periodontal practice reported 100% compliance by more than 80% of a selected group of recall patients with recommended recall intervals of 2 to 6 months (mostly 3 months).[33] There was no difference in compliance between insured and uninsured patients. In this practice,[33] a compelling need for continuous SPT always had been stressed. Patients who requested transfer to other dentists for recall were not considered noncompliant, however.

Noncompliance with suggested recall intervals is a great problem in periodontal practice. It has to be made abundantly clear to the patients that no known treatment will cure periodontal disease for the rest of their life and a commitment to SPT is the only way to secure the future maintenance of the natural dentition in health and comfortable function.

Summary

1. Every adult needs professional oral health maintenance care at least once a year.
2. Everybody with a significant loss of periodontal attachment (2 mm or more) needs periodontal therapy followed by SPT.
3. Supportive periodontal therapy should be based on recall every 3 to 4 months.
4. Supportive periodontal therapy should include professional removal of all supragingival and subgingival accretions.
5. Supportive periodontal therapy should locate and re-treat all sites with evidence of active periodontitis.
6. Topical application of fluoride should be part of all recall visits.
7. Patients without any evidence of active caries or periodontitis need recall only once or twice a year.

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