Effect of different frequencies of preventive maintenance treatment on periodontal conditions
5-year observations in general dentistry patients


Abstract. The protocol for this study was designed to evaluate the effects of supportive recall treatments provided with different frequencies, viz. at 3-, 6-, 12- and 18-month intervals. The subjects for the study were recruited from patients attending a public, general dentistry clinic. Prior to baseline, the subjects were given necessary dental treatments to provide a proper baseline for the study. Baseline, intermittent and final recordings included scores of dental plaque, bleeding on probing, probing depth and probing attachment level. Results were evaluated statistically by intergroup comparisons of changes for the various parameters from baseline to final examination after 5 years. The analyses showed some advantage to shorter recall intervals for plaque and bleeding scores. Although not statistically significant, there was a trend suggesting some rebound of sites >6 mm deep at the end of the study for the 18-month group, but not for the other groups. Similarly, there was a trend that the 18-month group showed a higher percentage of buccal/lingual furcation sites with attachment loss >1.0 mm than the other groups. Apart from these trends, the analyses failed to demonstrate differences between the groups for either changes of probing depths or probing attachment levels. The negative observations included identification of individuals with ‘disease progression’ in the various groups, using a series of arbitrary definitions for this parameter. The results of this trial suggest that recall intervals extended to a year may be acceptable for the purpose of reducing periodontal disease progression in individuals with a history of limited susceptibility to the disease.

Although there is little doubt as to the need for supportive professional care in order to maintain periodontal treatment results (Axelsson & Lindhe 1981a, 1981b), little attention has been focused on the required frequency of such maintenance care. In fact, only 2 studies seem to be available on this problem.

Lightner et al. (1971) performed a study in cadets of an air force academy. The effects of periodontal maintenance care provided every 3-, 6- or 12 months were compared over 4 years. Results indicated that plaque and gingivitis scores improved somewhat more in groups receiving more frequent maintenance. The scoring system used to assess periodontal disease progression, however, failed to demonstrate any significant change over the 4 years for any of the study groups.

Listgarten et al. (1989) conducted a study in subjects previously treated for periodontal disease. In one of their study groups, maintenance care was provided on a regular 3-month basis. The other study group received individually determined frequencies of maintenance care based upon darkfield microscopy of pooled subgingival samples from the deepest site in each sextant. Thresholds for percentages of spirochetes and motile rods in these
samples were used to stage the recall intervals. This method resulted in a gradual extension of the average intervals over the 4 years of study. Thus, the mean number of months since last maintenance treatment for this group was 8 months at the end of year 1, 15 months at the end of year 2, 22 months at the end of year 3, and 31 months at the end of year 4. The analyses of results disclosed no differences between the 2 treatment groups for any of the recorded periodontal parameters (plaque index, gingival index, probing depth and probing attachment level). Thus, within the time frame of their study, extended recall intervals for patients deemed stable from subgingival microbial samples did not result in deteriorating periodontal conditions as compared to continued recalls every 3rd month.

The present investigation was undertaken in view of the paucity of studies on suitable intervals for maintenance treatment. The subjects for the study were recruited from patients attending a public, general dentistry clinic. The effects of 4 different frequencies of preventive recall treatments on various parameters of dental health were investigated. This report describes the outcome on periodontal conditions.

Material and Methods
Study design
The study was conducted at a public dental clinic in the municipality of Kävlinge, Sweden. Following recruitment of subjects, an initial examination was performed. The subjects were then divided into 4 groups. Thereafter, the subjects were given all preventive, periodontal, surgical and restorative treatment deemed necessary to provide a proper baseline for the study. The baseline examination was carried out approximately 3 months after completion of this initial treatment. During the subsequent observation period, the protocol called for preventive treatment at recall intervals of 3, 6, 12 and 18 months respectively. Intermediate examinations for data collection were performed at 18 months for the 3, 6 and 18 month recall groups and at 12 months for the 12-month recall group. Final examination was performed after 54–66 months.

Subjects
The majority of the subjects for the study were recruited among recall patients at the study clinic. In addition, new patients seeking treatment at the clinic were included (about 20%). 391 patients were initially examined. For various reasons 68 subjects did not complete the initial treatment, and 64 other individuals dropped out during the 5-year study. Thus, 323 individuals were examined at baseline and 259 patients completed the entire study. An analysis after completion of the study, however, showed that the adherence to the intended protocol often had failed, affecting both recall intervals and time of final examination. It proved necessary to limit the analyses of the data to those individuals that had a final examination after at least 54 months but no more than 66 months. This reduced the total number of subjects to 153 (Table 1). The mean total observation period for the individuals selected in this way was 61 months for the 3-month group, 61 for the 6-month group, 58 for the 12-month group and 58 for the 18-month group. The mean number of maintenance visits during the observation interval for the selected subjects was 16 for the 3-month group, 9 for the 6-month group, 4 for all subjects of the 12-month group and 3 for all individuals of the 18-month group (Table 1). The overlap in maintenance treatments between the 3- and 6-month groups was caused by 1 individual of the 3-month group having received 9 treatments only.

Following initial examination, the original 391 subjects were divided into 4 experimental groups. First, 3 age groups were formed: 21–34 years, 35–49 years and ≥50 years. Within each of these age groups, equal numbers of individuals were matched into the 4 experimental groups, based upon the following additional characteristics and with decreasing priority: number of remaining teeth, number of decayed and filled tooth surfaces, number of decayed surfaces, full mouth dental plaque score and mean probing depth. However, parts of the effects of this initial matching were lost due to the high loss of subjects. This had to be considered during the data analyses.

Treatment
General dental treatment
Prior to baseline, subjects were given all preventive, periodontal, surgical and restorative therapy necessary to provide a baseline for the study. Treatment was provided by members of the clinic staff. To complete initial preventive and periodontal treatment in patients with periodontitis, the therapists spent a maximum of 4 visits, each 1 h, in fully dentate patients. Periodontal surgery was performed in parts of the dentition for 3 of the final 153 patients.

During the 5-year observation period, carious lesions found by the study examiners, as well as any additional lesions found by the dentists treating the individual patients were taken care of at the discretion of the treating dentist, as was other restorative treatment deemed indicated. Any need for emergency treatment between the examinations was also met. No patient required periodontal surgery during the maintenance period.

Maintenance treatment
The recall treatment during the observation period was generally provided during visits of 0.5–1.0 hour duration. The following preventive procedures were included: dental health infor-
mation, oral hygiene instruction, dietary counselling, tooth polishing, supra- and subgingival scaling and topical fluoride treatment with Duraphat varnish (2.23% F, Woelm Pharma Gmbh & Co, Germany). Personal oral hygiene aids provided were: soft toothbrushes, interdental brushes, triangular toothpicks and dental floss. Most patients had all preventive treatment provided by a dental hygienist. Some patients, however, were treated by a combination of a specially trained dental assistant and a dentist. In these situations, the dentist primarily carried out the supra- and subgingival scaling. This variation in clinical routine was related to the staffing conditions at the clinic.

Examiners

The clinical recordings were performed by 2 dental hygienists (examiners 1 and 2) and 2 dentists (examiners 3 and 4). The examiners had been trained and calibrated according to detailed diagnostic criteria for the recorded clinical parameters.

The examiners were also involved in treatment of patients. Practical reasons necessitated this arrangement.

Clinical recordings

Number of remaining teeth was determined by either examiner 3 or 4.

Dental plaque was scored by examiner 3. A disclosing dye (Diaplac Ron- dell, Astra, Sweden) was applied. Stained plaque along the gingival mar- gin that could be dislodged with a probe was recorded. 6 sites of each tooth were scored: mesiobuccal, mid- buccal, distobuccal, mesiolingual, mid- lingual and distolingual. Plaque score for each individual was calculated as a percentage of examined sites.

Bleeding on probing was interchange- ably recorded by either examiner 1 or 2 (to facilitate scheduling). An electronic, pressure sensitive probe (see below) was used for the same sites as for the plaque scores. The probing was made to probing depth, prior to the recordings of probing depth and probing attachment level. The % of sites with bleeding was calculated.

Probing depth and probing attachment level were independently measured by both examiner 1 and 2. A pressure sen- sitive, electronic probe (Electronic Peri- odontal Probe, Model 200, Vine Valley Research, Middlesex, NY, USA) with a standardized probing force of 0.5 N was used. The probe tip had a diameter of 0.5 mm and was calibrated in 1-mm incre- ments. The measurements were made to the nearest 0.5 mm. A soft acrylic stent, individually fitted, was used to provide reference points for the meas- urements of attachment levels. All sites, except buccal and lingual furcation sites, were measured by directing the tip of the probe longitudinally along the root surfaces. For furcation sites, the tip of the probe was guided by the furcal groove (when probeable) and the meas- urements were recorded at the deepest point at the site.

Recordings were obtained at the fol- lowing sites: For incisors and premolars (6 sites): mesiobuccal, buccal, distobuc- cal, mesiolingual, lingual and distolingual. For maxillary molars (8 sites): mesiobuccal, the midpoint of the mesio- buccal root, the buccal furcation site, the midpoint of the distobuccal root, distobuccal, mesiopalatal, the midpoint of the palatal root and distopalatal. For mandibular molars (10 sites): mesio- buccal, the midpoint of the mesiobuccal root, the buccal furcation site, the mid- point of the distobuccal root, distobuc- cal, mesiolingual, the midpoint of the mesiolingual root, the lingual furcation site, the midpoint of the distolingual root and distolingual.

The periodontal bone height was re- corded by a separate examiner from pretreatment full mouth periapical radiographs using the method of Bjo¨rn et al. (1969), measuring the bone height in increments of 10 relative to the total height of the tooth. Patient means for all measurable mesial and distal sites were calculated.

Analysis of data

For descriptive purposes, subject and group means were calculated for the various parameters from all examina- tions. For statistical comparisons be- tween treatment groups, changes from baseline to final examination were cal- culated. To be included, data for indi- vidual sites should be available at both of these examinations. The calculations performed varied with the parameters under evaluation as follows.

Plaque and bleeding scores

The change of scores from baseline to final examination for each individual was expressed as a percentage of poss- ible change from the baseline value. If the score was lower (better) at the final examination the possible changes con- stituted the interval from baseline score down to 0. If the score was higher (worse) at final examination the possi- ble changes constituted the interval up to 100. For example, a subject with a baseline score of 40% and a final score of 30% was considered to show 25% im- provement ((40−30)/40×100). A subject with the same 40% baseline score but with a final score of 70% was con- sidered to show 50% deterioration ((40− 70)/60×100). These calculated values for change were then used to rank all the participating 153 individuals. The rank numbers were used for the statistical testing. First, pre-tests of outcome dependence relative to age (3 age groups), relative to sex (male/female) and relative to level for baseline scores (above or below median value) were performed according to Kruskal-Wallis. Should none of these pre-tests show sig- nificant influence of any of these 3 fac- tors, the 4 treatment groups were com- pared using Kruskal-Wallis tests. Should one or more of the pre-tests show significant outcome dependence (p=0.05, adjusted for ties), subsequent analyses were conducted with a series of intergroup comparisons using Mann-Whitney tests, with the patients strati- fied according to those variables that were significant in the pre-tests. Correc- tion for multiple analyses was per- formed according to Bonferroni.

Probing depth ≥4 mm and ≥6 mm

The change in number of sites with probing depth ≥4 mm and ≥6 mm from baseline to final examination was expressed as a percentage of examined sites in the dentition (positive or nega- tive change). As for plaque and bleeding scores, these percentages were used to rank the 153 subjects. Pre-tests of outcome dependence and analyses of treatment group influence were also performed in the same manner as above.

Probing attachment levels

The degree of interexaminer reproduc- ibility of probing attachment level measurements was calculated from the independent, duplicate recordings available from examiner 1 and 2 at baseline and final examination. The differences between all pairs of duplic- ate recordings were calculated within each patient, followed by computation of the standard deviation of these dif-
Table 2. Number of patients in the 4 test groups with 0, 1, 2 or 3 teeth lost during the 5-year maintenance period

<table>
<thead>
<tr>
<th>No. teeth lost</th>
<th>Test group</th>
<th>3-month (n=36)</th>
<th>6-month (n=37)</th>
<th>12-month (n=38)</th>
<th>18-month (n=42)</th>
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<tr>
<td>0</td>
<td></td>
<td>33</td>
<td>30</td>
<td>30</td>
<td>37</td>
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<tr>
<td>1</td>
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</table>

Dental plaque

Mean % sites with plaque for all sites of the teeth for the 4 test groups throughout the study are presented in Fig. 1. After initial treatment, the scores were reduced from around 45% to 35% for all groups. The mean scores for the 3-month group showed a tendency to improve towards the end of the study, whilst the scores for the 18-month group indicated a rebound tendency.

Patients with disease progression

Disease progression for an individual subject was defined as presence of ≥1 sites (or ≥2 sites) showing attachment loss at final examination compared to baseline above a certain threshold (≥1.0 mm, ≥1.5 mm or ≥2.0 mm, comparing means of duplicates) coupled with a probing depth ≥4 mm at final examination for these sites. Thus, 6 different combinations were used to identify such patients.

Statistical comparisons of the number of patients with disease progression between the groups were performed using logistic regression (Hosmer & Lemeshow 1989). These analyses were limited to patients with presence of periodontitis at baseline as evidenced by presence of ≥1 sites with probing depth ≥6 mm at the baseline examination (total of 129 subjects). The outcome variable – disease progression – was investigated in a model with 4 additional variables: age, sex, % sites with probing depth ≥6 mm at baseline examination and mean pretreatment mesial/distal periodontal bone height.

Results

Number of remaining teeth

At baseline, following initial treatment, the mean numbers of remaining teeth were 24.0±5.5, 24.5±4.2, 23.7±6.4 and 24.6±5.3 respectively for the 3-, 6-, 12- and 18-month groups. Tooth loss from baseline to final examination is presented in Table 2 and was limited for all 4 groups.

Fig. 1. Mean plaque scores (%) for all sites for each of the 4 treatment groups prior to initial treatment (pretreatment), at baseline examination (following necessary dental treatment to provide a baseline), at intermediate examination every 12–18 months (exams 3, 4) and at final examination after 54–66 months.

Fig. 2. Mean bleeding on probing scores (%) for all sites throughout the study.
significant difference of plaque score change between the 3-month group and the 18-month group, but not for any other of the 6 intergroup comparisons (Table 3).

Plaque scores calculated for approximal sites showed the same trends as the scores for all sites, but were generally about 10% higher at all observation intervals. Results of statistical analyses were also comparable, although the difference between the 3-month group and the 18-month group did not reach statistical significance.

**Bleeding on probing**

Pretreatment bleeding scores for all sites of the teeth for the 4 test groups averaged 52–58% and improved to 30–35% levels at baseline. The mean scores appeared to become related to the recall frequencies towards the end of the study (Fig. 2).

Kruskal-Wallis tests of changes from baseline to final examination showed no outcome dependence related to either age group, sex or pretreatment scores. Influence of treatment group could thus also be evaluated from Kruskal-Wallis testing and demonstrated a significant overall influence of treatment group (p<0.05) and a significant difference of bleeding score change for the 3-month group as compared to the other groups (Z=2.37). Other intergroup comparisons did not show statistical significance.

Mean bleeding scores for approximal sites showed corresponding trends as the scores for all sites, although these scores were 5–8% higher for each of the groups throughout the study. Results of the statistical analyses also corresponded for approximal and all sites.

**Probing depths**

Approximal pretreatment probing depths averaged 3.8–4.0 mm for the 4 groups. Pretreatment frequencies of all sites except buccal/lingual furcation sites with probing depth >6 mm ranged between 3.2–3.9% for the 4 groups. Following initial treatment, at baseline, these frequencies ranged between 0.9–1.5%. Little change in these average frequencies was noted throughout the study (Fig. 3).

Statistical analyses of changes of % sites with probing depth >6 mm deep from baseline to final examination showed outcome dependence from Kruskal-Wallis tests for pretreatment % sites >6 mm (p<0.05), but not for age group or sex. Mann-Whitney tests comparing the 4 groups, compensating for influence of pretreatment % sites >6 mm, did not disclose any significant differences between the groups, although there was a trend suggesting that the 18-month group deviated from the other 3 groups due to a rebound tendency. Statistical analyses of changes of % sites >4 mm deep from baseline to final examination did not disclose any differences between the study groups.

**Probing attachment levels**

The overall degree of interexaminer reproducibility of probing attachment level measurements as expressed by the standard deviation of the differences of the duplicate recordings was 0.63±0.11 at baseline (range 0.00–1.01 among individual subjects) and 0.67±0.15 at final examination (range 0.36–1.34).

Mean changes of probing attachment levels compared to pretreatment for sites with different pretreatment probing depths are displayed in Figs. 4a-c. For sites with pretreatment depth 1–3 mm, there was little change at baseline. Thereafter, there was a slight but gradual loss of mean attachment for all 4 groups throughout the study. For sites with pretreatment depth 4–5 mm, all 4 groups demonstrated some gain of mean probing attachment at baseline, which was followed by a reversal to pretreatment levels or slightly below at the end of the study. For sites with pretreatment depth >6 mm, initial mean gains ranging between 0.6–0.8 mm for the 4 groups rebounded to levels between 0.3–0.5 mm.

Statistical analyses were performed to evaluate mean changes of probing attachment levels in the dentition from baseline to final examination. Analyses were carried out for all sites of the teeth and separately for sites with pretreatment depths 1–3 mm, 4–5 mm, >6 mm, and for buccal, lingual and approximal sites. None of these analyses disclosed any significant differences between the groups, nor any trends of the findings.

The frequencies of sites with gain or loss of probing attachment >1.0 mm at

<table>
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<tr>
<th>Table 3. Z-values for intergroup comparisons from Mann-Whitney tests for plaque score changes between baseline and final examinations</th>
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<tbody>
<tr>
<td><strong>Group</strong></td>
</tr>
<tr>
<td>3-month</td>
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<tr>
<td>6-month</td>
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<tr>
<td>12-month</td>
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<tr>
<td>Each of the groups has been compared to the others, compensating for the influence of age group and pretreatment scores. A statistically significant difference was observed between the 3- and 18-month groups (¢&gt;2.64). All other comparisons showed no differences.</td>
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</tbody>
</table>
various intervals compared to pretreatment are presented in Fig. 5. At baseline, around 10% of sites showed gain $\geq 1.0$ mm and around 5% of sites showed loss $\geq 1.0$ mm. At final examination, about 5% of sites showed gain $\geq 1.0$ mm and about 20% showed loss $\geq 1.0$ mm. Little difference in mean frequencies of gain $\geq 1.0$ mm or loss $\geq 1.0$ mm could be observed between the 4 study groups.

Statistical analyses were performed to evaluate changes of % sites with gain $\geq 1.0$ mm and % sites with loss $\geq 1.0$ mm from baseline to final examination. Analyses were carried out for all sites of the teeth, and separately for sites with pretreatment depths 1–3 mm, 4–5 mm, $\geq 6$ mm, and for buccal, lingual and approximal sites. Similar to the mean changes of attachment levels, none of these analyses disclosed any significant differences between the groups, nor any trends of the findings.

The frequencies of sites with gain or loss of probing attachment $\geq 2.0$ mm were also evaluated. These values were considerably lower than those for gain or loss $\geq 1.0$ mm. For example, % sites with loss $\geq 2.0$ mm at baseline was around 0.5% for all study groups and around 2% at final examination. The same statistical analyses for sites with changes $\geq 2.0$ mm were performed as for changes $\geq 1.0$ mm. Again, no significant differences between groups, nor any trends were noted.

The frequencies of probing attachment loss $\geq 1.0$ mm for buccal/lingual furcation sites at final examination compared to pretreatment were somewhat higher than for other sites combined. Thus, 24% of furcation sites showed $\geq 1.0$ mm loss in the 3-month group, 24% in the 6-month group, 23% in the 12-month group and 31% in the 18-month group. The percentages for the various groups suggested that the 18-month group had a higher frequency than each of the other groups. None of the comparisons between baseline and final examinations, however, reached statistical significance.

Patients with “disease progression”

The proportion of patients (%) showing disease progression between baseline and final examinations for the 4 test
groups using 6 different criteria, all of them combined with the requirement of probing depth ≥4 mm at final examination for the attachment loss sites, are shown in Table 4. On average, 84% of subjects showed disease progression using the lowest criteria level (≥1 sites with ≥1.0 mm loss), and 18% using the highest criteria (≥2 sites with ≥2.0 mm loss). There was no obvious trend comparing the 4 treatment groups over the various criteria levels. Use of logistic regression analyses, adjusting for the influence of age, sex, % sites ≥6 mm at baseline and pretreatment bone height failed to discover any statistically significant differences between the groups for any of the criteria levels.

Discussion

This report of our 5-year longitudinal investigation focuses on an evaluation of possible differences in periodontal disease progression between subjects receiving supportive care with varying frequencies. The study groups consisted of patients attending a general dentistry clinic. Thus, the subjects were not selected from a referral base of a periodontal specialty office, and may therefore have had limited susceptibility to periodontal disease. Mean pretreatment periodontal bone height was reduced by approximately 14% for age group 21–34 years, 18% for age group 35–49 years and 28% for age group ≥50 years. The pretreatment mean frequency of sites ≥6 mm amounted to 3.0–3.8% and improved to 0.9–1.5% at baseline following the initial treatment. At baseline, 129 of the participating 153 patients (84%) showed ≥1 sites with probing depth ≥6 mm. Bleeding scores were reduced from 53–58% to 30–37% by the initial treatment. These pre-experimental numbers indicate that the subjects by no means were resistant to periodontal disease. In addition, the data collected during the course of the study, in fact, demonstrated that the majority of subjects did show some disease progression (Table 4).

The frequencies of supportive care selected for evaluation ranged from every 3 months to every 18 months. The shortest interval, 3 months, was selected since results of previous long-term studies in periodontally diseased patients indicate that this interval is sufficient to prevent overall progression in initially diseased sites (Knowles et al. 1979, Pihlstrom et al. 1983, Ramfjord et al. 1987). The longest interval, 18 months, was selected as the longest interval that could be considered without introducing an ethical concern.

This trial was conducted and built into the routines of a public dental clinic, staffed with 7 dentists, 2 hygienists and 2 dental assistants trained in preventive procedures. Although this clinical environment may have an advantage as far as extrapolation of the findings to corresponding clinical situations, some compromise had to be introduced in the experimental design due to practical circumstances, reducing the standardization of some of the procedures. Thus, maintenance care was provided by different therapists and may therefore have varied somewhat. Following completion of the study it was found that the regularity of the recall intervals for the different groups had not been strictly adhered to. Cancellations by the patients, sick-leaves by the staff etc. had not been sufficiently supervised to prevent such irregularities. This called for a limitation of the data analyses to participating individuals of the various study groups with acceptable adherence to the initial protocol.

Thus, during interpretation of the findings of the present trial, some limitations should be kept in mind: (1) the overall degree of susceptibility to progressive periodontal disease among the participating subjects may have been limited; (2) the supportive care may have lacked some standardization; (3) the necessity to exclude a large number of participants from data analyses may have limited the analyses to more compliant subjects; (4) the observation interval was not uniform for all subjects and ranged from 54 to 66 months; and (5) the numbers of maintenance treatments during the study varied among the subjects within the 3- and 6-month groups and were on average lower than intended for both these groups. This latter limitation initiated a consideration of choice of statistical analyses for the data. Instead of intergroup comparisons, outcome variables for all subjects could be correlated to the number of maintenance treatments for the individuals. It was decided, however, to adhere to the original plan for the data analyses due to 2 reasons: (1) the 12- and 18-month groups would create a considerable clustering of the data at the low end of recall frequency; and (2) the possibility of detecting any influence of variation in recall frequency would seem to be higher using analyses which include comparisons between the 2 extreme frequency groups, i.e. the 3- and 18-month groups.

Kaldahl et al. (1996), in their 7-year study, found that smoking may compromise maintenance of periodontal attachment levels. In the present trial, distribution of smokers was comparable between the study groups, and therefore did not call for adjustments in the statistical analyses. The impact of smoking for all subjects however, will be presented in a separate report.

Over the 5 years of observation, some statistically-significant differences were observed between the study groups. At final examination compared to baseline, the 3-month group demonstrated improved plaque scores as compared to the 18-month group. Bleeding scores for the 3-month group improved more than for the other study groups. Although not statistically significant, there was a trend suggesting some rebound of sites ≥6 mm deep at the end of the study for the 18-month group, but not for the other groups. Similarly,

<table>
<thead>
<tr>
<th>Criteria for attachment loss</th>
<th>Test group</th>
<th>3-month (n=29)</th>
<th>6-month (n=28)</th>
<th>12-month (n=35)</th>
<th>18-month (n=37)</th>
<th>All (n=129)</th>
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</thead>
<tbody>
<tr>
<td>≥1 sites ≥1.0 mm</td>
<td>72</td>
<td>93</td>
<td>83</td>
<td>86</td>
<td>84</td>
<td>84</td>
</tr>
<tr>
<td>≥1 sites ≥1.5 mm</td>
<td>45</td>
<td>43</td>
<td>57</td>
<td>54</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>≥1 sites ≥2.0 mm</td>
<td>40</td>
<td>18</td>
<td>40</td>
<td>38</td>
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<td>34</td>
</tr>
<tr>
<td>≥2 sites ≥1.0 mm</td>
<td>1 sites</td>
<td>66</td>
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<td>76</td>
</tr>
<tr>
<td>≥2 sites ≥1.5 mm</td>
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<td>29</td>
<td>26</td>
<td>43</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>≥2 sites ≥2.0 mm</td>
<td>2 sites</td>
<td>21</td>
<td>14</td>
<td>14</td>
<td>22</td>
<td>18</td>
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</table>
there was a trend that the 18-month group showed a higher percentage of buccal/lingual furcation sites with attachment loss ≥1.0 mm than the other groups. Apart from these findings, the data analyses failed to disclose any differences between the study groups.

Compared to other longitudinal studies (Badersten et al. 1987, Söderholm & Egelberg 1982, Söderholm et al. 1982) plaque and bleeding scores remained somewhat high, including the 3- and 6-month groups. Although this may suggest that the efficiency of the supportive care was limited, it may also be related to differences in recording techniques as compared to these other studies.

Similar to several other studies, a slight but gradual mean loss of probing attachment was observed for initially shallow sites, as opposed to an overall slight but gradual mean loss of probing depth that may have undergone treatments due to traumatic injuries from these treatments and due to more trauma from diligent toothbrushing. No differences, however, were observed between treatment groups in this respect. This included analyses of mean attachment levels as well as frequencies of sites with attachment loss.

Patients with periodontal disease progression were identified using different criteria (presence of ≥1 sites or ≥2 sites with attachment loss ≥1.0 mm, ≥1.5 mm or ≥2.0 mm, determined from means of duplicate recordings), all of them combined with the requirement of probing depth ≥4 mm at final examination for the attachment loss sites. This latter requirement was introduced to avoid inclusion of sites with shallow probing depth that may have undergone attachment loss due to other reasons than progression of a periodontal disease of microbial origin ("Questionable periodontitis sites": Claflay & Egelberg (1994, 1995), "Recession sites": Joss et al. (1994)). Only patients with ≥1 sites ≥6 mm deep at baseline were included in these analyses (129 of the 153 subjects). This was done in order to avoid inclusion of individuals with no or little susceptibility to periodontal disease. These analyses demonstrated that many patients had experienced some disease progression (18-84% depending upon criteria levels), but that the proportions of these subjects did not vary with the frequencies of maintenance treatments. Apart from the lack of difference between study groups, it is noteworthy that disease progression occurred in spite of very frequent recall treatments. Obviously, this disease progression may not necessarily correspond to a true loss of periodontal attachment, but may also relate to a reversal of improved clinical attachment levels achieved during the initial periodontal treatment.

In this context, it should be recognized that the lack of differences between the study groups possibly could be explained by limited professional skills and inferior quality of the supportive treatments, i.e. that the findings mainly suggest that intrinsically inferior therapy had little impact when repeated. This seems unlikely, however, considering the marked improvements taking place following the initial treatment provided prior to baseline. These improvements would seem to be evidence of professional skills of the clinic staff.

As mentioned above, plaque and bleeding score results showed some benefits to the shorter maintenance intervals as compared to the longer intervals. Also, a couple of probing depth and probing attachment level parameters possibly suggested some disadvantage to the 18-month interval. It is conceivable, therefore, that this study has been conducted over a longer period than 5 years, significant differences in attachment levels may have developed. Nevertheless, the results of this study, similar to the results of Lightner et al. (1971) and Listgarten et al. (1989), suggest that recall intervals extended to at least a year may be acceptable for the purpose of reducing periodontal disease progression in individuals with a history of limited susceptibility to the disease.

The present report describes the outcome of the selected maintenance intervals on periodontal conditions for the various study groups. Recordings of carious lesions were also conducted throughout the 5 years of observation. The results of these analyses will be presented in a subsequent publication.

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Zusammenfassung

Wirkung verschiedener Intervalle präventiver Erhaltungsoterapie auf die parodontalen Verhältnisse. Beobachtungen über 5 Jahre bei allgemeinzahnärztlichen Patienten

Résumé

Effet sur l’état parodontal de la fréquence des traitements de maintenance préventifs. Observation sur 5 années chez des patients d’un service de dentisterie générale

Le protocole de cette étude a été conçu pour évaluer les effets de traitements de maintien réguliers fournis à différentes fréquences, c’est-à-dire à des intervalles de 3-mois, de 6-mois, de 12-mois ou de 18-mois. Les sujets devant participer à cette étude ont été recrutés parmi les patients fréquentant une clinique publique de dentisterie générale. Avant le début de l’étude, les sujets recevaient les traitements dentaires nécessaires, afin de fournir à l’étude une base initiale adéquate.

L’enregistrement des scores de la plaque, du fRITE par sondage, de la pro-fondeur de sondage et du niveau de l’attaque a été fait au début (baseline), à des examens intermédiaires et à la fin. Les résultats ont fait l’objet d’une évaluation statistique par comparaisons inter-groupes des résultats de cet essai semblent indiquer que des intervalles allant jusqu’à un an peuvent être acceptables pour réduire la progression de la maladie chez des sujets dont l’anamnèse indique une sensibilité limitée à la maladie.

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