Longitudinal periodontal tissue alterations during supportive therapy

Findings from subjects with normal and high susceptibility to periodontal disease


Abstract

Aim: The aim of the study was to evaluate disease progression during supportive periodontal therapy in (i) a group of 225 subjects with “normal” (NG) and (ii) a group with high susceptibility (HSG; n=109) to periodontal disease (based on their baseline disease status).

Material and methods: The following variables were recorded at the baseline examination (1 year after they received non-surgical periodontal therapy) and at the re-examination after 12 years of maintenance: number of teeth, plaque, probing pocket depth, probing attachment level, bone level in full mouth radiographs. All assessments were performed in a standardized manner and by well-trained and calibrated examiners. Supportive periodontal therapy was delivered 3–4 x per year and included repeated oral hygiene instruction and debridement. In addition, sites that bled on probing and had a PPD value of >5 mm received subgingival instrumentation.

Results: A comparison between the findings at baseline and after 12 years revealed that in the NG, most subjects maintained their periodontal condition unchanged during the maintenance period; only a few subjects experienced tooth loss and the figures describing the mean amount of bone and attachment loss were small (0.5 mm and 0.3 mm respectively). The HSG patients experienced some tooth loss and also lost significant amounts of bone and attachment during the 12 years of SPT. Thus, in this group of subjects, the mean overall PAL loss amounted to 0.8 mm, i.e., 0.06 mm/tooth surface/year. In the NG, the overall attachment loss was significantly smaller: 0.5 mm, i.e. 0.04 mm/tooth surface/year.

Conclusion: In subjects with a high susceptibility for periodontal disease who had been treated for this condition by non-surgical means, an SPT program including regularly repeated oral hygiene instruction and subgingival debridement, made it possible to maintain bone and attachment levels at a reasonably stable level over a 12-year period. A similar SPT provided to a group of subjects with normal susceptibility to periodontal disease, on the other hand, prevented almost entirely major tooth, bone and attachment loss.

Key words: progression; supportive therapy; susceptibility

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Findings from epidemiological studies have demonstrated that while the prevalence and severity of infectious periodontal disease increase with age, only a small subgroup of the population seems to suffer from advanced periodontal tissue breakdown (for review, see Papapanou & Lindhe (1997)). Subjects with high susceptibility to periodontal disease can be found in all age categories – children, young adults, adults, and elderly – but
their number apparently seems to increase with age.

Treatment of periodontal disease is traditionally based on mechanical therapy, including supra and subgingival debridement and frequently the eradication of deepened periodontal pockets. In subjects with moderate to advanced forms of periodontal disease who were given this basic therapy, and subsequently placed in carefully monitored plaque control programs, disease progression was markedly retarded (for reviews, see Cobb (1996), Palcans (1996)).

Axelsson & Lindhe (1981) demonstrated that in patients who, following surgical therapy for periodontal disease, received regular maintenance care (supportive periodontal treatment; SPT), the improved conditions at most teeth remained unaltered during a 6 year interval. In a control group of patients, who received similar surgical therapy but were not included in a SPT program, significant amounts of attachment loss occurred at more than 50% of sites. The results of Axelsson & Lindhe (1981) were confirmed in subsequent studies by e.g., Becker et al. (1984), Cortellini et al. (1994) who questioned the benefit of periodontal surgery in the absence of SPT.

To our knowledge, limited information is available regarding the rate of progression of periodontal tissue destruction in properly treated and maintained periodontitis susceptible subjects in relation to the disease progression that occurs in subjects with "normal" susceptibility to this disease.

The aim of the present study was therefore to evaluate disease progression in (i) a group of subjects with "normal" susceptibility to periodontal disease and (ii) a group of periodontitis susceptible patients who after basic therapy were enrolled in a carefully supervised maintenance program.

Material and Methods

The subjects included in this study were attending 2 supportive periodontal therapy (SPT) programs in Sweden. One SPT program was offered at the Department of Periodontology, Public Dental Service, Helsingborg and included subjects susceptible to periodontal disease (High Susceptible Group; HSG). The second program was provided at Community Dental Clinics in the region of Värmland, and included a large group of subjects exhibiting a "normal" prevalence of periodontal disease (Normal Group; NG).

HSG: the subjects in this group were recruited from a larger group of patients who between 1979–1985 were referred to the Department of Periodontology in Helsingborg for treatment of advanced periodontal disease. 170 patients, following clinical and radiographical examination and diagnosis, received case presentation and treatment planning according to a standardized protocol (Nyman et al. 1975). They were subsequently exposed to carefully performed non-surgical periodontal therapy. This treatment was carried out following local anesthesia and by specially trained dental hygienists. Each patient received 4–6 one hour treatment sessions.

During the basic therapy period attempts were made to retain all teeth including furcation involved molars. Following the termination of this therapy, the subjects were placed in a SPT program that included recall visits 3–4 times per year, according to individual needs. Each recall visit included assessment of the oral hygiene status of the patient, and evaluation of bleeding on probing and probing pocket depth at 6 surfaces of all teeth present (for details, see Westfelt et al. (1985)). Sites exhibiting bleeding on probing and a probing pocket depth of ≥5 mm received repeated subgingival instrumentation. Teeth that at any recall visit presented with marginal abscess and advanced mobility which did not subside following repeated mechanical therapy, were extracted. A comprehensive clinical examination was performed 1, 3, 5, 8, 10 and 12 years after the baseline examination.

34 subjects (20%) who exhibited ≥4 teeth with ≥2 mm additional probing attachment loss between the first and third year recall appointments, received additional treatment and were exited from the present investigation.

In addition, during the course of the SPT program 27 subjects were lost; 9 died, 12 moved from the Helsingborg area, and 6 decided, for different reasons, to discontinue the maintenance treatment.

In 1996, clinical and radiographical data were available from 109 patients that had been maintained in this SPT program for a period of 12 years.

NG: this group consisted of 232 subjects selected from a pool of patients at 12 Community Dental Clinics in Värmland (for details regarding the selection of the subjects see Wennström et al. (1993)). In 1978 the patients were examined and treated for various dental-periodontal lesions that had been identified in a screening examination. Immediately following the completion of this treatment, all subjects were exposed to a comprehensive baseline examination including both clinical and radiographical parameters.

During the 12 years of follow up, the subjects received preventive and therapeutic measures according to decisions made by the dentist on duty at the clinic. The SPT provided at these clinics was based on case presentation, oral hygiene instruction, supragingival and subgingival plaque control once to twice a year, according to each patient's need. The SPT was terminated after 12 years with a clinical and radiographical examination. 7 subjects (3%) who between the baseline and the 5-year re-examination exhibited ≥4 teeth with ≥2 mm additional probing attachment loss were retreated but exited from the study.

Examinations

Clinical evaluation

3rd molars were excluded from clinical and radiographic examinations in both groups. The following variables were recorded at the baseline examination (1 year following non-surgical therapy) and at the reexamination (12 years examination).

HSG

Number of teeth

Plaque (Pl I): presence/absence of plaque was determined after staining with disclosing solution at all mesial, buccal, distal and lingual surfaces. The percentage of surfaces with visible plaque was calculated.

Probing pocket depth (PPD): was measured using a manual probe with 1 mm increments and with a diameter of 0.5 mm. The measurements were made to the nearest 1 mm.

Probing attachment level (PAL): was determined from a fixed landmark on individually fabricated stents using the manual probe.

PPD and PAL measurements were performed at 6 surfaces (disto-buccal, disto-lingual, buccal, mesio-buccal, mesio-lingual, lingual) of all teeth present.
All examinations were performed in a standardized manner by 2 dental hygienists working together. During the course of the study one randomly selected tooth in each quadrant was re-measured to calculate the intra- and inter-operator variability and used to standardize and to calibrate the team.

NG

Number of teeth

Plaque (Pl I): presence/absence of plaque was determined after staining with disclosing solution at all mesial, buccal, distal and lingual surfaces. The percentage surfaces with visible plaque was calculated.

Probing pocket depth (PPD): was assessed at all mesial, distal, buccal, and lingual surfaces with the use of a flat graduated periodontal probe (HuFriedy). The measurements were made to the nearest 1 mm and the deepest value per surface was recorded.

Probing attachment level (PAL): was assessed from the cemento-enamel junction (CEJ) at all mesial, buccal and lingual surfaces. All measurements were made with the probe and to the nearest 1 mm. The deepest value at each surface was recorded.

Each subject was examined at all examinations by the same examiner. The three dentists who performed all examinations had been carefully trained and were repeatedly calibrated prior to the clinical examinations. The examiners were not otherwise involved in the SPT.

Radiographic evaluation (HSG and NG)

A set of full mouth intraoral radiographs was obtained from each subject at the Baseline and the 12 years follow-up examinations. A standardized parallel technique (Eggen 1969) was used. The radiographs were evaluated with regard to the alveolar bone level at the mesial and distal aspect of the teeth. Thus, the distance was determined between the cemento-enamel junction (CEJ) and the most coronal level along the root surface at which the periodontal ligament space was considered to have a normal width (Björn et al. 1969). Assessments in the posterior tooth region were primarily performed on bite-wing radiographs, whereas periapical radiographs were used for bone level measurements in the anterior tooth region. The radiographs were placed on an illuminated digitizer table (CalComp 91365, Digitizer Products Division, Scottsdale, Arizona, USA) and the anatomical landmarks were digitized by means of a cursor equipped with a magnifying lens (×2.5) and by the use of a specially developed computer program (Status XR, AEC, Gothenburg, Sweden) based on AutoCAD (Autodesk, Inc., USA). The linear distance between the landmarks (precision of 0.1 mm) was calculated. The data were converted to SAS files (Statistical Analyses System, Institute Inc., N.C. USA) for further processing. The radiographical data from both subject samples were recorded by one examiner.

Statistical analysis

Mean values for subjects were used for comparisons. Differences between the groups were analyzed using a non-paired t-test, while difference within the groups were analyzed using a paired t-test. p-values of <0.05 were considered to be statistically significant.

Results

Reproducibility analysis

In the NG the standard deviation of the duplicate measurements was 0.4 mm for PPD and 0.4 mm for PAL. The % of duplicate measurements showing ±1 mm difference was 99% for PPD and 96% for PAL. In the HSG the standard deviation for PPD and PAL was 0.4 mm and the percentage of sites within ±1 mm difference was 98%.

The standard deviation for duplicate assessments made in radiographs, examined at two different occasions by the same examiner, was 0.5 mm for NG and 0.6 mm for HSG. The % of sites showing difference within ±1 mm and ±2 mm was 93% and 99% in the NG and 82% and 96% in the HSG.

Table 1. Baseline characteristics of the 2 subject samples

<table>
<thead>
<tr>
<th></th>
<th>NG</th>
<th>HSG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects number</td>
<td>225</td>
<td>109</td>
</tr>
<tr>
<td>age (years)</td>
<td>41.8 (13.6)</td>
<td>45.5 (8.4)</td>
</tr>
<tr>
<td>male</td>
<td>46%</td>
<td>42%</td>
</tr>
<tr>
<td>Number of teeth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>all teeth</td>
<td>23.5 (3.9) range 10–28</td>
<td>24.1 (3.7) range 12–28</td>
</tr>
<tr>
<td>non-molars</td>
<td>18.2 (2.1)</td>
<td>18.0 (2.0)</td>
</tr>
<tr>
<td>molars</td>
<td>5.3 (2.7)</td>
<td>6.1 (2.1)</td>
</tr>
<tr>
<td>Plaque %(\text{a)})</td>
<td>32 (20)</td>
<td>14 (18)</td>
</tr>
<tr>
<td>PPD mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>all teeth</td>
<td>2.6 (0.3)</td>
<td>3.3 (0.6)</td>
</tr>
<tr>
<td>non-molars(\text{a)})</td>
<td>2.5 (0.4)</td>
<td>2.9 (0.6)</td>
</tr>
<tr>
<td>molars(\text{a)})</td>
<td>2.8 (0.5)(\text{b)})</td>
<td>4.0 (0.8)(\text{b)})</td>
</tr>
<tr>
<td>Bone level mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>all teeth</td>
<td>3.4 (1.1)</td>
<td>6.5 (1.1)</td>
</tr>
<tr>
<td>non-molars(\text{a)})</td>
<td>3.5 (1.1)</td>
<td>6.6 (1.2)</td>
</tr>
<tr>
<td>molars(\text{a)})</td>
<td>3.3 (1.0)</td>
<td>6.2 (1.2)</td>
</tr>
</tbody>
</table>

NG=normal group, HSG=high susceptible group, PPD=probing pocket depth, R×BL=radiographic bone level. Mean±(SD).

\(\text{a)}\) A statistically significant difference between the NG and the HSG \((p<0.001)\).

\(\text{b)}\) A statistically significant difference within the groups between molar and non-molar teeth \((p<0.001)\).

Baseline examination

Table 1 presents some of the Baseline characteristics of the 2 study groups. The mean age of the NG (\(n=225\)) and HSG (\(n=109\)) subjects was 41.8 and 45.5 years, respectively. The percentage of males in the 2 groups was 42% and 46%. The mean number of teeth present was about 24 in both groups, out of which about 18 were non-molars and 5 (in the NG) and 6 (in the HSG) were molars. The mean plaque score was significantly lower in HSG than in NG (14% versus 32%). Also the amount of periodontal tissue destruction was markedly different in the 2 groups. Thus, in the HSG the mean PPD value was significantly higher than in NG (3.3 mm vs 2.6 mm) and the mean bone loss was 6.5 mm (HSG) and 3.4 mm in the NG \((p<0.001)\).

The % distribution of sites with different probing pocket depths (PPD categories: 0–3 mm, 4–5 mm, ≥6 mm)
is reported in Fig. 1. In the NG, the percentage of shallow pockets averaged between 95% and 85% in non-molar and molar sites respectively. In the HSG, the corresponding figures were 72% and 51%. There were few pockets in the ≥6 mm PPD category in the NG while in the HSG between 5% (non-molar) and 20% (molar) sites had remaining deep pockets.

Fig. 2 reports the cumulative % of subjects in the two samples with respect to number of teeth that had at least 1 site with a PPD value of ≥6 mm. More than 80% of subjects in the NG had ≥1 tooth with a deep pocket. In HSG 50% of subjects had at least 6 teeth with a PPD value of ≥6 mm.

Fig. 3 describes the percentage of sites in 3 different radiographical (R×BL) bone level (BL) categories; 0–3 mm, 4–5 mm, ≥6 mm (R×BL categories). In the NG about 50% of all sites exhibited no or minimal bone loss (R×BL: 0–3 mm) while in the HSG only a few sites in this category could be identified. In the HSG about 60% of all sites belonged to the R×BL ≥6 mm category but only 2–4% of such sites occurred in the NG. Within each group the bone loss in the molar and non-molar segment of the dentition was similar.

The cumulative percentage of subjects in the two samples with respect to number of teeth with bone loss of ≥6 mm is described in Fig. 4. In the NG 50% of subject had only one such site, while in the HSG all subjects had 9 sites or more with advanced bone loss.

The findings reported in Figs. 1–4 clearly illustrate that the subjects in the HSG, at baseline, had suffered much more periodontal tissue breakdown than the subjects in the NG.

**Longitudinal changes**

**Tooth loss**

Teeth were lost in both the NG and the HSG over the 12 years period (Table 2). The main reason for tooth loss in the NG was caries, endodontic complications or trauma. In the HSG most tooth loss was associated with advanced and progressive periodontal disease.

The number of teeth lost was significantly higher in the HSG (1.9) than in


Table 2. Number of teeth in the NG and the HSG that were lost during the 12 years of maintenance. Mean±SD

<table>
<thead>
<tr>
<th></th>
<th>NG</th>
<th>HSG</th>
</tr>
</thead>
<tbody>
<tr>
<td>all teeth(^a)</td>
<td>0.3 (1.0)</td>
<td>1.9 (2.2)</td>
</tr>
<tr>
<td>non-molars(^a)</td>
<td>0.2 (0.6)</td>
<td>0.8 (1.3)</td>
</tr>
<tr>
<td>molars(^a)</td>
<td>0.1 (0.7)</td>
<td>1.1 (1.2)</td>
</tr>
</tbody>
</table>

\(^a\) A statistically significant difference (p<0.001) between the NG and the HSG.

Table 3. Baseline radiographic bone level (R×BL) for teeth that were retained or had to be extracted during the maintenance period

<table>
<thead>
<tr>
<th></th>
<th>NG</th>
<th>HSG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-molars(^a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>non-extracted</td>
<td>3.5 (1.1)</td>
<td>6.4 (1.2)</td>
</tr>
<tr>
<td>extracted &amp;3 (1.2)(^b)</td>
<td>8.3 (2.0)(^b)</td>
<td></td>
</tr>
<tr>
<td>Molars(^a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>non-extracted</td>
<td>3.2 (0.9)</td>
<td>6.0 (1.3)</td>
</tr>
<tr>
<td>extracted</td>
<td>3.6 (1.5)(^b)</td>
<td>6.7 (1.5)</td>
</tr>
</tbody>
</table>

Mean±SD.

\(^a\) A statistically significant difference (p<0.001) between the NG and the HSG.

\(^b\) A statistically significant difference (p<0.05) within the NG and the HSG.

The mean R×BL at baseline was higher for teeth that were extracted than for teeth that were retained (non-molars: 8.3 versus 6.4 mm and molars: 6.7 versus 6.0 mm), while in the NG the difference between the 2 categories of teeth was smaller.

PPD change

Table 4 describes the percentage of sites that exhibited an additional PPD increase of ≥2 mm during the observed period. The results are reported for different Baseline PPD categories. In non-molar sites in the NG, between 0–2% of sites exhibited deepening of pockets. The corresponding numbers in HSG were 1.1–15.8%. At molar sites 2.4–16.1% (NG) and 18.1–34.3% (HSG) exhibited deepened pockets. In general, initially shallow pocket sites tended to display a more pronounced deepening of pockets over time than initially deeper pocket sites.

PAL change

The mean additional loss of probing attachment level (Fig. 6) amounted in the HSG to 0.8 mm (0.85 mm at buccal sites, 0.8 mm at approximal and 0.85 mm at lingual sites). The corresponding values for the NG were significantly lower: 0.45 mm (all sites), 0.5 mm (buccal), 0.3 mm (approximal) and 0.4 mm (lingual sites). In both the HSG and the NG the percentage of sites with ≥2 mm attachment loss was more pronounced at molars than at non-molars (Fig. 7).

The cumulative percentage of subjects with respect to number of teeth with probing attachment loss of ≥2 mm at approximal surfaces is presented in Fig. 8. In the NG the % of such subjects was low, <10% of subjects had 8 teeth exhibiting additional attachment loss. 70% of HSG subjects had ≥8 teeth with this attachment level change.

Bone change

The mean overall bone loss between baseline and 12 years was more pronounced in the HSG than in the NG; 0.8 mm versus 0.3 mm. The % of sites that exhibited additional bone loss of ≥2 mm were 16% versus 4% (for non-molars) and 28% versus 4% (for molars) in the HSG and the NG respectively (Fig. 7). In the NG the % of subjects had no teeth with such additional bone loss, and only 8% had ≥4 teeth in this category. In the HSG all subjects experienced longitudinal bone loss; 80% of subjects exhibited ≥2 mm loss at ≥4 teeth, 38% at ≥8 teeth and 10% at ≥12 teeth.

Discussion

The findings of the present investigation demonstrated that a SPT program including regularly (every 3 months) repeated oral hygiene instruction and subgingival debridement in 80% of subjects with a high susceptibility to periodontal disease maintained the bone and the attachment levels reasonably stable over a 12-year period. In 20% (34 subjects) of such cases, however periodontal disease continued to progress after non surgical periodontal therapy. A similar SPT in a group of subjects with “normal” susceptibility to periodontal disease, on the other hand, was successful (>95% of such cases) in almost entirely preventing major tooth, bone and attachment loss.
Fig. 6. Longitudinal change. Mean (±SD) amount of PAL increase (mm) that occurred at different sites (buccal, approximal, lingual) in the NG and the HSG during the observation period. At all sites HSG exhibited significantly higher PAL increase than NG.

Fig. 8. Longitudinal change. Cumulative percentage of subjects in the NG and HSG with respect to number of teeth that exhibited >2 mm of PAL loss between Baseline and 12 years.

Fig. 7. Longitudinal change. % of sites (mean ±SD) per subjects that exhibited an increased PAL (probing attachment level) or PPD (probing pocket depth) or radiographic bone loss during the 12-year period. Both in non-molars and molars the HSG subjects exhibited a significantly higher number of progressing sites than the subjects in the NG.

Fig. 9. Longitudinal change. Cumulative percentage of subjects in the NG and the HSG with respect to number of teeth that exhibited ≥2 mm of radiographic bone loss (R×Bl) between baseline and 12 years. In the HSG about 50% of subjects had 6 such teeth. The corresponding number in the NG was <5%.

Baseline comparisons

For the present trial, 2 different groups of subjects with similar age and similar number of remaining teeth were identified; one representing a “normal” population judged to have a reasonably low prevalence of severe periodontal disease (NG) and one representing a sample of subjects with a verified high susceptibility to periodontitis (HSG). This difference between the NG and the HSG was evidenced by several observations. In the NG (i) the average bone level at Baseline was 3.4 mm while in the HSG the corresponding value was 6.6 mm, (ii) <50% of subjects had <2 teeth with ≥6 mm bone loss, while in the HSG all subjects had at least 9 teeth with this amount of bone loss, (iii) few subjects had >1 tooth with deep pockets while in the HSG about 50% of subjects had >6 teeth with pockets ≥6 mm. In several aspects the findings made in the NG are in agreement with data previously reported by, e.g., Papapanou et al. (1988) and Hugoson et al. (1998) from cross sectional studies in different subject samples from Sweden. It is suggested, therefore, that the present NG exhibited a prevalence and severity of periodontal disease reasonably similar to that of a randomly selected Swedish population. On the other hand, all subjects in the HSG exhibited signs of advanced bone loss which were similar to those found in the “disease susceptible subgroups” (about 10%) of the subject samples studied by Papapanou et al. (1988) and Hugoson et al. (1998).

Prior to the start of the 12 years of monitoring all subjects, both in NG and the HSG received comprehensive, non-surgical mechanical periodontal therapy. In addition, and if necessary, essential endodontic and restorative treatment was provided. One year after the completion of this basic therapy, the baseline examination for the present study was performed. It was observed that in the NG this non-surgical intervention had resulted in a high frequency of shallow (<4 mm) pockets (≥90% of sites in non-molars and ≥80% of sites in molars) and a low frequency of deep (≥6 mm) pockets (no sites in non-molars and <2% of sites in molars). In the HSG, the corresponding non-surgical treatment was less effective in reducing PPD. Thus, at the baseline examination
Longitudinal evaluation

In the NG, most subjects maintained their periodontal condition unchanged during the 12 years of maintenance; only a few subjects experienced tooth loss and the figures describing mean amount of bone and attachment loss were small (0.5 mm and 0.3 mm, respectively). This observation is in agreement with data from studies evaluating the effect of supportive periodontal therapy in different subject samples with varying susceptibility to periodontal disease (Lövdal et al. 1961, Suomi et al. 1971, Axelsson et al. 1991). A more detailed examination, however, revealed that a small subgroup within the NG experienced a significant amount of disease progression. The degree of tooth, attachment, and bone loss that occurred in this subsample of the NG appeared to be similar to that reported for small subsamples of subjects in longitudinal studies of untreated periodontal disease (Löe et al. 1986, Papapanou et al. 1989, Lindhe et al. 1989). The current observation is also in agreement with findings reported by Hugoson et al. (1998) from 3 cross sectional surveys – 10 years apart – of the periodontal conditions of randomly selected subjects from the county of Jönköping in Sweden. The authors concluded that although there was a general improvement in the overall periodontal conditions with time (e.g., number of retained teeth, level of gingivitis, mean probing pocket depth values), a substantial decrease in the frequency of subjects affected by severe periodontitis could not be observed in the interval between 1973 and 1993.

In the current study, the subjects in the NG lost 0.3 teeth during the 12 years interval while the corresponding loss in the HSG was 1.9; 0.8 non-molar and 1.1 molar teeth. Fig. 5 illustrates that 80% of the subjects in the HSG lost 0–3 teeth, while about 20% lost 4+ teeth. No subject in this group lost more than 8 teeth. The figures on tooth loss in the HSG are similar to those reported by Hirschfeld & Wasserman (1978). They monitored 600 patients with periodontal disease who had been treated by non-surgical means and been maintained in SPT for a period of 15 years. The authors stated that 83% of their patients lost between 0–3 teeth (well maintained), while about 13% (downhill) lost 4–9 teeth, and 4% (extreme downhill) lost 10–23 teeth. The current data on tooth loss are also similar to those of McFall (1982) who reported on tooth loss in 100 periodontitis susceptible subjects. These patients were, during the basic therapy phase, exposed to either surgical or non-surgical periodontal therapy and were subsequently maintained in a carefully controlled SPT program for an average of 19 years. McFall (1982) used the same criteria as Hirschfeld & Wasserman (1978) and noted that 73% of the subjects could be classified as well maintained, while 15% were downhill and 8% extreme downhill cases. The annual loss of teeth in the sample described by McFall (1982) was 0.14, a figure which is almost identical to the annual tooth loss experienced in the present HSG (0.16).

The HSG patients experienced not only tooth loss but they also lost significant amounts of bone and attachment during the 12 years of SPT. Thus, in this group of subjects the mean overall PAL amounted to 0.8 mm, i.e. 0.06 mm/tooth surface/year. In the NG the overall attachment loss was significantly smaller; 0.5 mm, i.e. 0.04 mm/tooth surface/year. The calculated annual loss of attachment observed in the current HSG sample is similar to that reported by Brägger et al. (1992). They monitored 52 subjects treated for mild to moderate periodontal disease over a 7 year period of maintenance and observed an overall attachment loss at approximate surfaces of 0.6 mm (about 0.08 mm/year). In addition, the current data are also in agreement with findings by Ramfjord (1987), and Kaldahl et al. (1996) who reported on the long term outcome of periodontal therapy in well maintained subjects.

The amount of disease progression that occurred in the HSG was, however, apparently much higher than that reported by Lindhe & Nyman (1984) who, during a 14 year period monitored a group of 61 subjects with extremely advanced loss of periodontal tissue support. Following an initial examination, the 61 patients were treated with “scaling and root planing, and surgical elimination of pathologically deepened pockets” and then enrolled in a SPT which “included regular appointments every 3 to 6 months”. In this group of...
subjects only minor alterations occurred in the overall attachment and bone levels during the 14 years. Lindhe & Nyman (1984), however, also reported that “a small number of sites in a few patients lost a substantial amount of attachment ... Thus, 43 surfaces in 15 different patients were exposed to recurrent periodontal disease of significant magnitude ... caused the loss of 16 teeth in 7 different patients during the maintenance period”. In this context, it should also be realized that while in the current HSG a large number of furcation involved molars were treated by non-surgical means during the basic therapy phase and retained, such teeth were in the Lindhe & Nyman (1984) sample exposed to regenerative therapy or extracted.

The attachment loss in the current HSG was substantially smaller than that reported for groups of periodontitis susceptible subjects with untreated disease or who following treatment failed to receive proper SPT (Nyman et al. 1977, Axelsson & Lindhe 1981, Becker et al. 1984, Löe et al. 1986). The amount of attachment loss that occurred in the HSG should also be compared to findings recently reported by Rosling et al. (1997). They monitored a group of 30 susceptible subjects who had been treated for periodontal disease by non-surgical means. During a 3-year period, these 30 subjects received meticulous supragingival but no subgingival treatment. The mean attachment loss experienced by this particular group of subjects was 0.53 mm during the 3 years – 0.17 mm/tooth surface/year, i.e., 3 times the annual attachment loss observed in the present HSG.

Fig. 6 illustrate the longitudinal PAL alterations that occurred at different surfaces (buccal, approximal and lingual) in the HSG and the NG. From the data reported it is obvious that the HSG lost more than 2× the amount of PAL at approximal and lingual surfaces than the NG, while at buccal surfaces the difference between the 2 groups was not pronounced. There are reasons to suggest that attachment loss experienced at the buccal tooth surfaces in the NG was related more to tooth cleaning habits than to disease progression. This conclusion is in agreement with findings by Löe et al. (1978) who monitored a group of 565 healthy subjects from Norway, aged between 17 and 30 years. They reported that the annual rate of attachment loss for approximal surfaces varied between 0.05 and 0.10 mm but that the buccal surfaces showed higher rates; 0.08–0.14 mm/year.

Initially both the NG and HSG consisted of subjects who responded properly to non-surgical therapy. 34 subjects (20% of the original sample) in HSG and 7 subjects (3%) in NG were however exited after 3–5 years of SPT because they showed obvious disease recurrence and attachment loss progression. This finding is in agreement with long term studies evaluating the effect of periodontal treatment. Thus in reports by Hirschfeld and Wasserman (1978), Lindhe and Nyman (1984), Ramfjord (1987), Claflay et al. (1990), Kaldahl et al. (1996), a subset of patients and sites could be identified that responded poorly to therapy despite good plaque control and regular recall appointments.

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Zusammenfassung

Langzeitstudie zur Veränderung des parodontalen Gewebes während der Erhaltungstherapie


Ergebnisse: Ein Vergleich zwischen den Ergebnissen bei der Eingangsuntersuchung und nach 12 Jahren zeigte, dass während der Erhaltungsperiode in der NG die meisten ihren parodontalen Zustand unverändert erhalten konnten; nur einige Personen hatten Zähne verloren und die Zahlen die den durchschnittlichen Knochen-bzw. Attachmentverlust beschreiben waren niedrig (0.5 mm bzw. 0.3 mm). Während der 12-jährigen Erhaltungstherapie hatten die HSG-Patienten einige Zähne sowie signifikant an Knochenhöhe und Attachment verloren. Daher betrug in dieser Patientengruppe der durchschnittliche Attachmentverlust 0.8 mm oder 0.06 mm/Zahn und Jahr. In der NG war der durchschnittliche Attachmentverlust signifikant geringer; 0.5 mm oder 0.04 mm/Zahn und Jahr.


Résumé

Alterations tissulaires parodontales longitudinales durant le traitement de maintenance. Découvertes de sujets à susceptibility normale ou élevée vis-à-vis de la maladie parodontale

Le but de cette étude a été d’évaluer la progression de la maladie durant la thérapie de maintien parodontal dans un groupe de 225 sujets ayant une susceptibility normale (NG) et un autre à susceptibility élevée (HSG; n = 109) à la maladie parodontale basée sur leur état au moment de l’examen initial. Les variables suivantes ont été enregistrées lors de l’examen initial soit un an après qu’ils aient reçu un traitement parodontal non-chirurgical, et lors du réexamen après 12 années de maintenance: nombre de dents, plaque dentaire, profondeur de poches au sondage (PPD), niveau d’attaque au sondage (PAL), niveau osseux apprécié sur des radiographies. Toutes les mesures ont été effectuées d’une manière standard et par des examinateurs bien entraînés et calibrés. Le traitement de maintenance avait été effectué 3 à 4 par année et comprenait une instruction répétée en hygiène buccale et un détartrage. De plus les sites qui saignaient au sondage et qui avaient un PPD ≥ 5 mm recevaient un surfaçage radioculaire. Une comparaison entre les découvertes lors de l’examen initial et après 12 années a révélé que chez les sujets NG, la plupart d’entre eux maintenaient une condition parodontale inchangée durant la période de maintenance. Seul quelques sujets avaient perdu des dents et les chiffres décrivant la quantité moyenne de leur perte osseuse ou d’attache conjonctive étaient faibles, respectivement de
0.5 mm et de 0.3 mm. Les patients HSG avaient accusé quelques pertes dentaires et avaient aussi perdu des quantités significatives d’os et d’attache durant ces 12 années. Dans ce groupe de sujets, la perte PAL moyenne s’élevait à 0.8 mm c.-à-d. 0.06 mm/surface dentaire/année. Le perte d’attache dans le groupe NG était significativement plus faible c.-à-d. 0.5 mm, soit 0.04 mm/surface dentaire/année. Chez les sujets à forte susceptibilité à la maladie parodontale qui avaient été traités pour ce problème par des moyens non-chirurgicaux un programme de maintenance incluant une instruction en hygiène buccale répétée et un surfacage radiculaire permet de garder l’os et le niveau d’attache relativement stables pendant une période de 12 années. Un programme semblable suivi par des sujets à susceptibilité normale à la maladie parodontale prévient presque entièrement toute perte d’attache osseuse ou dentaire.

References

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