CLINICAL AND MICROBIOLOGICAL EFFECTS OF
SCALING AND ROOT PLANING IN PERIODONTAL
DISEASE

SUMMARY
Background/aims: With this study we tried to evaluate the microbial and clinical effects of SRP in 30 (mean age 40 ± 10) subjects over a 12-month period.
Method: Clinical assessments of plaque, gingival redness, suppuration, bleeding on probing, pocket depth and attachment level were made prior to SRP and at 3, 6, 9, and 12 months post-therapy. Subgingival plaque samples were taken at each visit and analyzed. Each subject also received maintenance scaling at each of the subsequent monitoring visits. Differences in clinical parameters and prevalence and levels of bacterial species were analyzed pre- and post-therapy.
Results: Mean pocket depth (mm±SEM) decreased from 3.2±0.3 at baseline to 2.9±0.3 at 12 months (p<0.01). Mean attachment level showed significant reduction at 6 months, but did not diminish further. Bleeding on probing and plaque were significantly reduced at 12 months (p<0.001, p<0.05, respectively). P. gingivalis, B. forsythus and T. denticola decreased in prevalence and levels up to the 6-month visit and remained at these lower levels at 9 and 12 months. Significant increases in levels and prevalence were noted at 12 months for Actinomyces naeslundii genospecies 2, Actinomyces odontolyticus, Fusobacterium nucleatum ss polymorphum, Streptococcus mitis, Capnocytophaga sp, and Veillonella parvula.
Conclusions: The data suggest that the maintenance phase of therapy may be essential in consolidating clinical and microbiological improvements achieved as a result of initial therapy.

Keywords: periodontal diseases; SRP; microbiology; pocket depth.

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Introduction

Scaling and root planning (SRP) is one of the most commonly utilized procedures for the treatment of periodontal diseases. Numerous studies have reported beneficial results from this treatment in both clinical and microbial parameters. Most of the beneficial effects of SRP appeared to occur within the first 3 months with mean attachment levels and pocket depths remaining relatively unchanged at later time points. Thus, available data imply a second stage process in which the majority of the clinical and perhaps the microbial benefit occurs within a short time frame followed by a period of stability aided by maintenance scaling and home care procedures.

Long term studies have reported a decrease in the levels and prevalence of certain species. Rawlinson and coworkers (1993) examined 30 sites in 15 adult periodontitis subjects by culture 12 months post SRP and found decreases in the counts of Prevotella intermedia, Porphyromonas asaccharolytica, and Prevotella veroralis/buccalis. Subsequently, it was demonstrated that subjects with a poor response to SRP did not harbor these species in high numbers pre-therapy (Haffajee et al. 1997b). 30 of the subjects evaluated in these studies continued to be monitored at 9 and 12 months post SRP providing the opportunity to examine clinical and microbial changes during the maintenance phase.

The purpose of the present investigation was to evaluate the microbial and clinical effects of SRP in 30 subjects who were followed for a 12-month period and received periodontal maintenance scaling and oral hygiene instruction every 3 months.

Material and Methods

Subject selection

Subjects were ± 40 years of age, had at least 20 natural teeth and at least 8 sites with pocket depth ± 4 mm and/or attachment level ± 3 mm. Subjects were excluded from participation if they had any systemic condition which would affect the progress of periodontal disease or the nature of the therapy and if they needed to be premedicated for dental treatment and monitoring. Subjects were also excluded if had received periodontal and/or antibiotic therapy in the previous 3 months, had evidence of localized juvenile periodontitis, or necrotizing ulcerative gingivitis.

A total of 30 subjects were included in the study. Those subjects exhibiting a loss of attachment of ±2.5 mm at any site or an overall mean attachment level loss at any of the maintenance visits were exited from the study and received further treatment.

Clinical procedures

Clinical parameters were assessed at 6 sites per tooth at each time point. Plaque, gingival redness, bleeding on probing (BOP) and suppurative were recorded as present or absent (0/1). Pocket depths and attachment levels were measured twice at each visit using a periodontal probe, and the mean of each pair of measurements computed for each site. After baseline clinical and microbiological assessments, subjects received 4 quadrants of SRP under local anesthesia. SRP was completed within 1 month.

Subjects were monitored clinically and microbiologically at 3, 6, 9, and 12 months post therapy. At each post-therapy monitoring time point, subjects received full mouth periodontal maintenance scaling and instruction in home care procedures.

After removal of supragingival plaque, subgingival plaque samples were taken from the mesiobuccal aspect of each tooth in each subject using individual sterile Gracey curettes. Counts of 40 subgingival species were determined in each plaque.

Statistical analysis

The percentage of sites that exhibited gingival redness, plaque, BOP and suppuration were computed for each subject for each monitoring visit and averaged across subjects for that visit.

The means of each pair of pocket depth and attachment level measurements at each site were averaged within subjects and then averaged across subjects for each time point. The percentage of sites colonized by each test species was determined for each subject and was averaged across subjects for each time point. The significance of differences between the baseline and 12 month data was determined using the Wilcoxon signed ranks test.

Results

Baseline clinical parameters of the 30 subjects in the study are described in Table 1.

Average pocket depth and attachment level for the group at baseline was 3.2±0.3 mm and 3.0±0.9 mm, respectively. The effects of SRP on the clinical parameters at 12 months are shown in over the 12-month period. Significant decreases post SRP were seen for pocket depth (p<0.001), BOP (p<0.001), and plaque...
Fig. 2 presents mean values for each clinical parameter at each visit. Pocket depth and BOP showed a continued decrease. Attachment level showed a significant decrease at 3 months post SRP but failed to reach significance at the 12-month time point (p<0.05), although stabilization of attachment level was demonstrated. The effect of SRP at different initial pocket depths is shown in Fig. 3. Deeper pockets (±6 mm) showed the greatest decrease in both pocket depth and attachment level. Intermediate sites (4–6 mm) showed moderate improvement in pocket depth while shallow sites exhibited the least amount of change.

The levels and prevalence of 40 subgingival species examined at baseline and 12 months are shown in Fig. 4. Significant increases in levels and prevalence were seen for Actinomyces naeslundii genospecies 2, Actinomyces odontolyticus, Capnocytophaga sp., Fusobacterium nucleatum ss polymorphum, Streptococcus mitis and Veillonella parvula while B. forsythus, P. gingivalis and S. noxia decreased significantly.

Table 1.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean (±SD)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>40±10</td>
<td>30-50</td>
</tr>
<tr>
<td>No. missing teeth</td>
<td>2.5±2.6</td>
<td>0-8</td>
</tr>
<tr>
<td>% males</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>Mean pocket depth (mm)</td>
<td>3.2±0.3</td>
<td>2.6-3.9</td>
</tr>
<tr>
<td>Mean attachment level (mm)</td>
<td>3.0±0.9</td>
<td>1.4-4.9</td>
</tr>
<tr>
<td>% sites with plaque</td>
<td>73±80</td>
<td>0-100</td>
</tr>
<tr>
<td>% sites with red</td>
<td>68±31</td>
<td>0-100</td>
</tr>
<tr>
<td>% sites with BOP</td>
<td>68±38</td>
<td>3-100</td>
</tr>
<tr>
<td>% sites with suppuration</td>
<td>3±6</td>
<td>0-22</td>
</tr>
<tr>
<td>% sites with pocket depth &lt; 4 mm</td>
<td>69±13</td>
<td>45-92</td>
</tr>
<tr>
<td>% sites with pocket depth 4-6 mm</td>
<td>29±13</td>
<td>7-55</td>
</tr>
<tr>
<td>% sites with pocket depth &gt; 6mm</td>
<td>2±2</td>
<td>0-11</td>
</tr>
<tr>
<td>% sites with attachment lvl &lt; 4 mm</td>
<td>75±22</td>
<td>22-99</td>
</tr>
</tbody>
</table>

(p<0.05). Fig. 2 presents mean values for each clinical parameter at each visit. Pocket depth and BOP showed a continued decrease. Attachment level showed a significant decrease at 3 months post SRP but failed to reach significance at the 12-month time point (p<0.059), although stabilization of attachment level was demonstrated. The effect of SRP at different initial pocket depths is shown in Fig. 3. Deeper pockets (±6 mm) showed the greatest decrease in both pocket depth and attachment level. Intermediate sites (4–6 mm) showed moderate improvement in pocket depth while shallow sites exhibited the least amount of change.

The levels and prevalence of 40 subgingival species examined at baseline and 12 months are shown in Fig. 4. Significant increases in levels and prevalence were seen for Actinomyces naeslundii genospecies 2, Actinomyces odontolyticus, Capnocytophaga sp., Fusobacterium nucleatum ss polymorphum, Streptococcus mitis and Veillonella parvula while B. forsythus, P. gingivalis and S. noxia decreased significantly.
The effect of SRP on pocket depth, as well as prevalence for B. forsythus and P. gingivalis at each time point is presented in Fig. 5. Both species declined in prevalence until 6 months and showed a slight increase at 9 and 12 months post therapy whereas proportions continued to decrease. The decline in proportion of these species paralleled the decrease in pocket depth.

Discussion

The purpose of the present investigation was to evaluate the clinical and microbial changes that occurred during the maintenance phase after an initial therapy that consisted of meticulous full-mouth SRP. The results indicated that most clinical improvement and microbial changes occurred during the first 3 months post SRP. In particular, mean attachment level decreased significantly at 3 months and was maintained during the 12 months of the study. Other clinical parameters such as mean pocket depth and % of sites that bled on probing showed a marked improvement 3 months post SRP but also continued to show improvement during the maintenance period. Interestingly, these improvements occurred in the absence of a significant decrease in the % of sites exhibiting visible plaque or gingenial redness.

The clinical changes were similar to those reported in a number of studies that described initial mean clinical improvement followed by a period of periodontal tissue stability (Pihlström et al. 1983, Ramfjord et al. 1987, Kahlald et al. 1993). The mean clinical changes in the present investigation were accompanied by specific changes in mean levels of the subgingival microbiota. Periodontal pathogens, such as B. forsythus and P. gingivalis and the suspected pathogens, T. denticola and S. constellatus were significantly reduced in prevalence, proportions and in levels post SRP. The most profound reduction occurred during the first 3 months post SRP.

Fig. 2. Plot of mean clinical parameters (±SEM) at baseline, 3, 6, 9, and 12 months post SRP for the 32 subjects. Significance of differences for the mean clinical parameters at different time points was evaluated using the Quade test. Note that values on the y-axis in the left panel present pocket depth on the left and attachment level on the right, and neither axis starts at 0.

Fig. 3. Plot of mean pocket depth and attachment level (±SEM) at baseline, 3, 6, 9, and 12 months post SRP at sites with initial pocket depths of <4, 4–6 and ±6
although these species were still reduced significantly at 12 months when compared with pre-treatment levels. Thus, maintenance scaling appeared to be important in maintaining the initial post therapy decreases in selected species for prolonged periods of time. While SRP appeared to be effective in lowering the numbers of selected periodontal pathogens, none of these species was eliminated from any subject by this therapy. Therefore if elimination of a specific subgingival species is thought to be essential for therapeutic success, SRP is unlikely to be the treatment of choice. Further, SRP appeared to be effective in reducing a defined subset of subgingival species, suggesting that subjects with low numbers or none of these species would receive limited benefit from this therapy.

The results from this group demonstrated that SRP is an effective long-term therapy when combined with regular maintenance in a large proportion of subjects with adult periodontitis. One of the strongest associations seen in the data of the current investigation was that between decreased pocket depth and the decreased proportion of B. forsythus. In the present investigation, it was not clear whether a decrease in pocket depth affected colonization by B. forsythus, or whether a decrease in B. forsythus led to an improved clinical outcome. However, the prevalence of B. forsythus is lower at shallow sites and in periodontally healthy and successfully treated individuals (Haffajee et al. 1998). Thus, the effectiveness of SRP may be due, in part, to its ability to reduce levels of B. forsythus which...
can be maintained at these lower levels by maintenance procedures. One of the findings in this study was the increase in prevalence and levels of V. parvula and A. naeslundii genospecies 2. Clearly, a decrease in proportion of some species, such as B. forsythus, must be accompanied by an increase in proportion of all or a specific subset of subgingival species. The data suggest that this increase was limited to specific species. At 12 months post-therapy, A. naeslundii genospecies 2 was detected on average at about 80% of sampled sites and comprised almost 40% of the total probe count. These findings suggest that one of the more important effects of SRP was to increase suspected beneficial species that might diminish potential harmful effects of other, more pathogenic species colonizing the same periodontal site.

While SRP is the most commonly employed form of periodontal therapy in both the initial and maintenance phases of treatment, it is unlikely to be sufficient to control periodontal disease progression in all periodontitis subjects. The procedure is designed to remove hard and soft deposits from tooth surfaces above and below the gingival margin.

SRP, however, does have limitations including the inability to adequately instrument deep periodontal pockets and bifurcations as well as remove organisms within the tissues lining the periodontal pocket. Removal of deposits and organisms from these locations may require surgical intervention and/or the use of antimicrobial agents. Nonetheless, the results of the present investigation confirm the notion that SRP can control periodontal diseases in a major proportion of adult periodontitis subjects since almost 60% (18/30) of subjects were successfully treated and maintained by this therapy.

Conclusions

The results of the present investigation reinforced the notion that most clinical improvement and the greatest reduction in specific subgingival species occurred within the first 6 months post SRP and clinical and microbial parameters remained stable or improved modestly thereafter. The initial clinical improvements and long-term stability were associated with limited changes in the subgingival microbiota. There were decreases in periodontal pathogens such as B. forsythus and P. gingivalis, as well as an increase in potentially beneficial Actinomyces species. The data suggest that the maintenance phase of therapy may be essential in consolidating clinical and microbiological improvements achieved as a result of initial therapy.
REFERENCES:


