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Quadrant root planing versus same-day full-mouth root planing

I. Clinical findings

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Abstract

Objectives: The aim of this study was to test the hypothesis that same-day full-mouth scaling and root planing (FM-SRP) resulted in greater clinical improvement compared to quadrant scaling and root planing (Q-SRP) in chronic periodontitis patients over a period of 6 months.

Materials and Methods: Forty patients were recruited into this study. Subjects were randomised into two groups. The FM-SRP group received full-mouth scaling and root planing completed within the same day, while the Q-SRP group received quadrant root planing at 2-weekly intervals over four consecutive sessions. Whole-mouth clinical measurements were recorded with a manual periodontal probe at baseline (BAS) and at reassessment 1 (R1) (approximately 6 weeks after the completion of therapy), and at reassessment 2 (R2) (6 months after the initiation of therapy). Selected site analyses were performed on the deepest site in each quadrant before and after therapy (R1 and R2) and clinical indices were recorded with an electronic pressure sensitive probe. In addition, during the active phase of treatment clinical data were collected at 2-weekly intervals from the remaining untreated quadrants in the Q-SRP group only.

Results: Both therapies resulted in significant improvements in all clinical indices both at R1 and R2. A continuous clinical improvement was seen for both treatment groups during the experimental period, which reached peak levels at 6 months (ΔPD = 1.8 mm, ΔCAL = 1.1 mm, $p < 0.001$; PD: pocket depth; CAL: clinical attachment level). The selected-site analysis revealed no significant differences in any clinical index between the two treatment groups at R2 (ΔPD = 2.8 mm, ΔRAL = 1.1 mm; RAL: relative attachment level). At the selected sites, the analysis of the deep pockets (>7 mm) showed a significantly greater gain in RAL for the FM-SRP group compared to the Q-SRP group at R2 ($p < 0.05$). The results of this analysis however, should be interpreted with care due to the small number of deep pockets. Data from the Q-SRP group provided an insight into how treated and untreated quadrants responded during the initiation of plaque control measures. There were significant reductions in PD, suppuration (SUP), modified gingival index (MGI) and plaque index (PI) in the remaining untreated quadrants in the Q-SRP group during the initial phase of treatment ($p < 0.05$), while minimum changes in RALs and bleeding on probing (BOP) occurred. Nevertheless, the improvement in PD was clearly inferior to that seen after scaling and root planing.

Conclusion: Following both therapeutic modalities, there were marked clinical improvements at both R1 and R2 (6 months) from baseline. The current study, in contrast to previous findings, failed to show that FM-SRP is a more efficacious periodontal treatment modality compared to Q-SRP. However, both modalities are efficacious and the clinician should select the treatment modality based on practical considerations related to patient preference and clinical workload.

Key words: chronic periodontitis; full-mouth periodontal therapy; quadrant scaling and root planing

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It has been shown that non-surgical periodontal treatment of patients with severely advanced periodontitis results in a marked clinical improvement in pockets of moderate depth, as well as pockets greater than 12 mm (Badersten et al. 1984a) with mean pocket depth (PD) reductions ranging from 5.5–5.9 to 3.5–3.9 mm and bleeding scores improvements from 80–90% to 15–20% after treatment (Badersten et al. 1984b). The clinical improvements after mechanical debridement of advanced periodontitis patients remained unchanged during a maintenance period of 18 months (Lindhe et al. 1982). During this period, recurrence occurred but was a rare finding. When it did develop, it was considered to be related to either ineffective prophylactic measures or inadequate debridement during active treatment (Waerhaug 1978).

Quirynen et al. (1995) introduced the one-stage full-mouth disinfection and compared the clinical and microbiological effects of this treatment strategy (test group) with the more typical treatment of quadrant scaling and root planing (Q-SRP) at 2-weekly intervals (control group). The rationale behind this treatment strategy was to prevent re-infection of the treated sites from the remaining untreated pockets and from other intra-oral niches. Patients in the test group ($n = 5$) underwent optimal intra-oral disinfection, which included tongue cleaning and gargling, irrigation and rinsing with chlorhexidine. The control group ($n = 5$) did not use chlorhexidine during or following the active phase of treatment. The results showed a significantly greater PD reduction of 0.8 mm for the full-mouth scaling and root planing (FM-SRP) group compared to the Q-SRP group at the 1- and 2-month visits, but this was noted only for deep pockets (7–8 mm). There was also a significant improvement in terms of reduction in the microbes at 1 month as determined by both phase contrast microscopy and culture method.

Bollen et al. (1998) from the same research group examined the clinical and microbiological effects of the one-stage full-mouth disinfection on 16 patients followed over 4 months. The clinical design of the study was similar to that of previous studies except that patients were instructed to rinse with chlorhexidine 0.2% solution for 2 months instead of 2 weeks post-treatment and to spray the tonsils with 0.2% chlorhexidine spray during this period. The results showed that post-treatment PD reductions and microbiological findings were more favourable than those reported in the pilot study (Quirynen et al. 1995). This observation emphasises the beneficial effects of the extended use of chlorhexidine on clinical and microbiological parameters.

Quirynen et al. (2000) repeated this study with the aim of determining whether chlorhexidine was critical to the treatment outcome. They followed the patients from baseline through 1, 2, 4 and 8 months. Although all patients improved dramatically from baseline, the full-mouth root planing group with and without disinfection had an additional 1.5 mm PD improvement than the quadrant root planing group. The gains over quadrant root planing were marked in pockets $\geqslant 7$ mm. They concluded that the elimination of the periodontopathogens in addition to the possible host response benefits after the one-stage full-mouth therapy is the effective aspect of the therapy rather than the beneficial effect of periodontal and oral chlorhexidine disinfection.

The primary aim of our study was to determine whether same-day full-mouth scaling and root planing (FM-SRP) in our clinical setting would show greater improvements in clinical indices than Q-SRP in moderate to advanced chronic periodontitis patients.

Materials and Methods

Patient selection

Forty untreated chronic periodontitis patients aged 31–70 years were recruited from new referrals to Glasgow Dental Hospital and School and attended for the 6-month duration of the study. Each patient had at least two non-adjacent sites per quadrant with PD of 5 mm or over and radiographic evidence of bone loss with no history of systemic disease nor antibiotic therapy within the last 3 months or during the course of the study. Cigarette smoking status was self-reported. Subjects were considered smokers if they had been smoking five or more cigarettes a day. All patients gave informed consent. We initially recruited 58 patients but 18 were excluded from the study for various reasons including failure to attend their appointment twice ($N = 10$, $N_{\text{Q-SRP}} = 7$, $N_{\text{FM-SRP}} = 3$) and intake of antibiotics during treatment ($N = 8$, $N_{\text{Q-SRP}} = 3$, $N_{\text{FM-SRP}} = 5$). One of the participants was prescribed antibiotics for a tooth abscess and the others for reasons not related to periodontal treatment.

The demographic details of the patients recruited to the current study are shown in Table 1 and indicate that the ethnicity, mean age and smokers are similar between the two treatment groups.

Clinical interventions and experimental design

The trial design and timings of clinical interventions and assessments are depicted in Fig. 1. After an initial screening visit for recruitment, baseline measurements were recorded. Subsequently, FM-SRP or Q-SRP was performed on each patient by an experienced periodontist (D. A. A.). The patients were then reassessed at reassessment 1 (R1), 6 weeks after the last clinical intervention and at reassessment 2 (R2), 6 months from baseline. The 6-week reassessment for the Q-SRP group was at 13 weeks $\pm$ 1 week from baseline but was slightly different for the FM-SRP group (7 weeks $\pm$ 1 week). Despite the difference in healing time between the two groups at R1 from baseline, we made this short-term comparison as it reflected our routine reassessment practice (6 weeks after the last intervention). R2 was performed 6 months after baseline for both the FM-SRP and the Q-SRP groups.

Scaling and root planing was performed under local anaesthesia using an assortment of periodontal curettes (American Eagle, Gracey Access curettes, Missoula, MT, USA) and ultrasonic scalers (Cavitron; Dentsply, York, PA,

Table 1. Demographic details for the Q-SRP and FM-SRP groups

	No. of subjects	Ethnic group	Age*	Males	Females	Smokers
Q-SRP	20	19 Caucasians; one Asian	42 (31–70)	13	7	7
FM-SRP	20	19 Caucasians; one Asian	48 (36–67)	10	10	8

Q-SRP = quadrant scaling and root planing; FM-SRP = full-mouth scaling and root planing; No. = number.

*Mean (min–max).

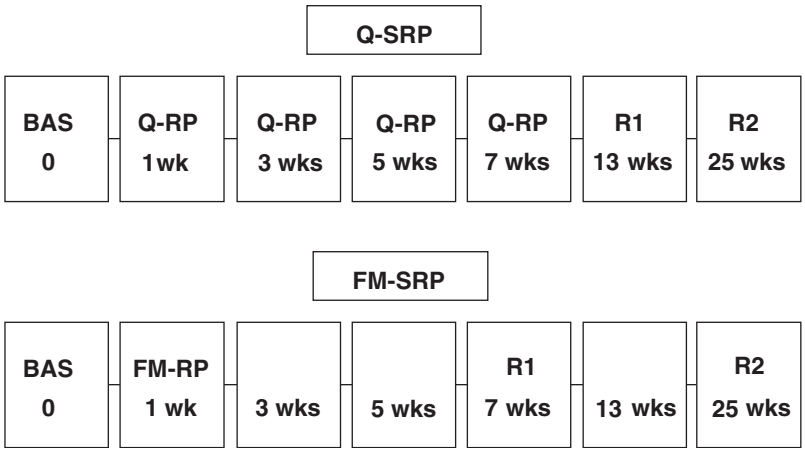

Fig. 1. Timeline for clinical interventions. Q-SRP = quadrant scaling and root planing; Q-RP = quadrant root planing; FM-SRP = full-mouth scaling and root planing; FM-RP = full-mouth root planing; BAS = baseline; R1 = reassessment 1; R2 = reassessment 2.

USA). During instrumentation, pockets were irrigated with saline. In the Q-SRP group, root planing started with the upper right quadrant, and continued clockwise over four visits at 2-weekly intervals. This order was kept consistent for all patients in the Q-SRP group, so that equal healing time was allowed for the treated quadrants. It is important to note that in the FM-SRP group, root planing was performed in one lower and one upper quadrant at the morning clinical session and the other half of the dentition was completed in the afternoon session of the same day, rather than in 24 h as adopted by Quirynen et al. (1995). Time spent for scaling each quadrant was approximately 1 h. FM-SRP was performed over approximately 4 h in total, 2 h at the morning session and 2 h at the afternoon session on the same day, with 1.5 h interval between the morning and the afternoon session. No disinfection, i.e. antiseptics such as chlorhexidine, was used in either treatment group and all participants were advised not to use antiseptic mouthwash during the course of treatment so that plaque control was achieved solely by optimal toothbrushing.

Subsequent to the same-day FM-SRP, the patients in this treatment group were recalled at 2-weekly intervals for oral hygiene instructions (OHIs), so that they received an equal amount of oral hygiene reinforcement as the Q-SRP group (Fig. 1). Treated quadrants in both the Q-SRP and the FM-SRP groups did not receive any additional root planing during the initial phase of treatment. At visit 5 (13 weeks), maintenance scaling and polish was given to all participants which comprised ultrasonic scaling to the sites that had residual PD of 5 mm or more and bled on probing.

Clinical measurements were collected by a calibrated single examiner (D. A. A.) and unbiased data collection was assured by having no access to recordings of previous visits. The subjects were assessed with conventional full-mouth periodontal pocket charts at three time points: baseline (BAS), R1 and R2. PD and clinical attachment levels (CALs) were determined at six sites per tooth to the nearest millimetre (mm) using a PCP 12 probe (Hu-Friedy Mfg Co., Chicago, IL, USA). Bleeding on probing (BOP) was also recorded dichotomously as present or absent after PD probing on each arch.

Furthermore, one site per quadrant with the deepest PD (not less than 5 mm deep) and with no endodontic or furcation involvement was selected from each patient at baseline for selected-site clinical analysis. At each selected site, the modified gingival index (MGI) (Lobene et al. 1986), plaque index (PI) (Silness & Loe 1964), BOP, suppuration (SUP), PD and relative attachment level (RAL) were recorded. Each tooth was air-dried, MGI was assessed, and a periodontal probe was used to determine PI. PD and RAL were measured at each site using an electronic probe with controlled force of 20 *g* (Florida probe; Gibbs et al. 1988) using the PD and disc probes, respectively. Each site was measured twice to assess the variability of the probing measurements. If there was a discrepancy of more than 1.0 mm between the two readings, then one more additional recording was taken and the mean of these two measurements that had less than a 1.0 mm difference was used (Clark et al. 1993). Clinical measurements were recorded from the computer screen by an assistant. The operator was blinded to these recordings. BOP and SUP were recorded between PD measurements.

For the Q-SRP group, in addition to clinical assessment at baseline and R1 and R2, clinical measurements were also collected from the selected sites in the remaining untreated quadrants at 2-weekly intervals. For example, at baseline, clinical parameters were determined at sites in all quadrants; at visit 2, in the second, third and fourth quadrant; at visit 3, in the third and fourth quadrant; at visit 4, in the fourth quadrant prior to root planing.

After the first session of scaling and root planing, an anonymised questionnaire was given to participants of both groups to evaluate post-treatment complications after 1 and 2 days. Day 1 was 24 h after the first session of quadrant or full-mouth scaling and root planing, whereas day 2 was between 24 and 48 h after the first session of scaling and root planing. The discomfort a patient experienced was rated on a 10 cm horizontal visual analogue scale with marks every centimetre (cm). The cross mark placed by the patient was scored to the nearest cm, resulting in a score between 0 (no pain) and 10 (extreme pain). The percentage of patients taking analgesics, the number of painkillers and body temperature (thermometer placed at the axilla for 5 m) were also recorded. The occurrence of cold sores or oral ulcers was reported by the patient or recorded by the examiner at the following visit, 2 weeks later.

Statistical analysis of data

The clinical data were statistically analysed using Minitab statistical package (Minitab release 12, State College, PA, USA) and SPSS statistical software (SPSS 5, Chicago, IL, USA). The analyses were made using the patient as the experimental unit.

Changes in clinical indices were analysed using the General Linear Model (GLM) test. Treatment modality, smoking status and time (visits) and their interactions were modelled as fixed factors and the patient as a random factor, with the PD, CAL, BOP and number of sites >5 mm for the whole-mouth sites, or the PD and RAL for the

selected sites as the response variables for each analysis. The initial model included the three main effects of treatment, smoking and visit, together with the three-way interaction of these factors.

The whole-mouth clinical indices and the selected-site clinical indices (PD and RAL) were compared between the two treatments at baseline, R1 and R2, using the two-sample *t*-test. Differences in patients and the frequency of sites that were BOP positive (from one to four) were compared between the groups using the χ^2 test. The Mann–Whitney test was applied to analyse PI differences between patients in Q-SRP and FM-SRP groups. PD and RAL changes of the site-specific clinical indices at deep pockets (>7 mm) and moderately deep pockets (>5 and <7 mm) were compared between the two treatments at R1 and R2 from baseline. For the Q-SRP group, during the initial phase of treatment (baseline to fourth scaling session) the paired *t*-test was used to analyse PD and RAL at the untreated sites in quadrant 4, the Wilcoxon signed rank test to analyse MGI and PI and the McNemar test to analyse BOP and SUP.

Statistical significance was set at the 95% confidence level ($p<0.05$) for hypothesis testing.

Results

Significant improvements were noted in all clinical indices at both R1 and R2, reaching peak levels at R2. The GLM analysis revealed that there was no significant three- or two-way interaction among the following fixed factors: treatment modality (Q-SRP and FM-SRP), smoking and visits (BAS, R1, R2) on the whole-mouth clinical indices (PD, CAL, BOP, number of sites >5 mm) ($p>0.05$). Similarly, no significant effect of treatment modality or smoking on the whole-mouth indices was seen ($p>0.05$). This series of analyses showed that there was a statistically significant visit effect on PD, CAL, BOP and number of sites >5 mm ($p<0.001$). There was also a significant (random) patient effect on these clinical indices ($p<0.01$). The GLM analysis for the selected sites showed that there was a significant three-way interaction among the following fixed factors: treatment modality, smoking and visit effect on PD and RAL of the selected sites ($p<0.001$) (data not shown). It was difficult to interpret the effect of each factor on the selected-site clinical indices, but it appeared that smoking was the predominant factor in this three-way interaction, with Q-SRP non-smokers showing the greatest improvements in PD at R1, when compared to Q-SRP smokers and FM-SRP smokers and non-smokers (Table 2).

Tables 3 and 4 illustrate the changes in the whole-mouth and the selected-site clinical indices, respectively. At R2, PD was reduced by 1.8 and 1.7 mm for the Q-SRP and FM-SRP groups, respectively, with a concomitant gain in CAL of 1.1 mm ($p<0.001$). At this time point, BOP was reduced by 58% and 57% for the Q-SRP and FM-SRP groups, respectively ($p<0.001$). The corresponding values for the decrease in the number of sites >5 mm was 60 and 56, respectively

Table 2. Changes in selected-site clinical indices with therapy based on smoking status (mean ± SD)

	Q-SRP ($N=13$) non-smokers	Q-SRP ($N=7$) smokers	FM-SRP ($N=12$) non-smokers	FM-SRP ($N=8$) smokers
BAS–R1				
PD	3.2 ± 0.8	1.9 ± 0.4	2.3 ± 0.8	1.9 ± 0.7
RAL	1.0 ± 0.5	0.4 ± 0.7	0.9 ± 0.5	0.5 ± 0.6
BAS–R2				
PD	3.4 ± 0.8	2.2 ± 0.5	2.9 ± 1.1	2.3 ± 0.6
RAL	1.2 ± 0.5	0.6 ± 0.4	1.5 ± 0.6	0.8 ± 0.6

Q-SRP = quadrant scaling and root planing; FM-SRP = full-mouth scaling and root planing; BAS = baseline; R1 = reassessment 1; R2 = reassessment 2; PD = pocket depth; RAL = relative attachment level.

Table 3. Whole-mouth clinical indices (mean ± SD)

$N_{\text{Q-SRP}}=20$ $N_{\text{FM-SRP}}=20$	Baseline	R1	R2	Change (BAS–R1)	Change (BAS–R2)
PD (mm)					
Q-SRP	4.4 ± 0.7	2.7 ± 0.3	2.6 ± 0.3	1.7 ± 0.6*	1.8 ± 0.7*
FM-SRP	4.4 ± 0.6	2.8 ± 0.3	2.6 ± 0.2	1.6 ± 0.5*	1.7 ± 0.5*
CAL (mm)					
Q-SRP	5.0 ± 0.9	3.9 ± 0.9	3.9 ± 0.9	1.1 ± 0.5*	1.1 ± 0.6*
FM-SRP	5.1 ± 1.0	4.1 ± 1.0	4.0 ± 1.0	1.0 ± 0.4*	1.1 ± 0.4*
BOP (%)					
Q-SRP	71.0 ± 19.0	17.0 ± 9.0	13.0 ± 7.0	54.0 ± 18.0*	58.0 ± 19.0*
FM-SRP	68.0 ± 17.0	17.0 ± 10.0	10.0 ± 6.0	51.0 ± 16.0*	57.0 ± 18.0*
No. sites >5 mm					
Q-SRP	69.0 ± 20.0	13.0 ± 12.0	9.0 ± 9.0	56.0 ± 20.0*	60.0 ± 20.0*
FM-SRP	68.0 ± 26.0	13.0 ± 7.0	8.0 ± 5.0	55.0 ± 23.0*	56.0 ± 22.0*

No statistically significant differences were noted between Q-SRP and FM-SRP groups ($p>0.05$). Q-SRP = quadrant scaling and root planing; FM-SRP = full mouth scaling and root planing; BAS = baseline; R1 = reassessment 1; R2 = reassessment 2; PD = pocket depth; CAL = clinical attachment level; BOP = bleeding on probing; no. = number.
*$p<0.001$; *p*-values represent longitudinal changes from baseline within each treatment group.

Table 4. Selected-site clinical indices (mean ± SD)

$N_{\text{Q-SRP}}=20$ $N_{\text{FM-SRP}}=20$	Baseline	R1	R2	Change (BAS–R1)	Change (BAS–R2)
PD (mm)					
Q-SRP	6.2 ± 0.7	3.5 ± 0.8	3.3 ± 0.5	2.7 ± 0.8*,§	2.9 ± 0.8§
FM-SRP	5.9 ± 0.8	3.8 ± 0.6	3.3 ± 0.5	2.1 ± 0.8*,§	2.6 ± 1.0§
RAL (mm)					
Q-SRP	14.0 ± 1.7	13.2 ± 1.8	13.0 ± 1.7	0.8 ± 0.7§	1.0 ± 0.5§
FM-SRP	13.9 ± 1.3	13.1 ± 1.3	12.7 ± 1.4	0.8 ± 0.6§	1.2 ± 0.7§

Q-SRP = quadrant scaling and root planing; FM-SRP = full mouth scaling and root planing; BAS = baseline; R1 = reassessment 1; R2 = reassessment 2; PD = pocket depth; RAL = relative attachment level.
*$p<0.05$; *p*-values represent differences between Q-SRP and FM-SRP groups.
§$p<0.001$; *p*-values represent longitudinal changes from baseline within each treatment group.

($p<0.001$). With respect to the selected-site analysis, PD was reduced by 2.9 and 2.6 mm at R2 for the Q-SRP and FM-SRP groups, respectively ($p<0.001$), with a gain in RAL of 1.0 and 1.2 mm at R2, respectively ($p<0.001$). In addition, significant improvements in BOP (Fig. 2) and PI (Fig. 3) were also seen following therapy ($p<0.001$).

The comparison of the two treatment groups revealed no significant differences in the whole-mouth clinical indices (Table 3). However, the selected-site analysis revealed a significantly greater PD reduction of 0.6 mm for the Q-SRP group at R1 from baseline ($p<0.05$), but this comparison is probably biased by the difference in time allowed for healing between the two therapies. It was of interest that no significant differences in any clinical index between the treatment groups at R2 from baseline (Table 4). Similarly, no significant differences in BOP and PI were found between the two treatment modalities at any time point (Figs. 2 and 3).

Analysis of moderately deep (>5 and <7 mm) and deep (>7 mm) pockets at selected sites

The comparison of PD and RAL in moderately deep pockets (>5 and <7 mm) and deep pockets (>7 mm) showed a significantly greater PD reduction in moderately deep pockets for the Q-SRP group between baseline and R1 compared to the FM-SRP group ($p<0.05$) (Fig. 4), but this was not the case for deep pockets (Fig. 5). This finding indicates that the greater clinical improvement at the selected sites between baseline and R1 seen for the Q-SRP group was because of differences in PD reductions in the moderately deep pockets only, between the two treatment groups. The analysis of the deep pockets showed a significantly greater gain in RAL for the FM-SRP group compared to the Q-SRP group between baseline and R2 ($p<0.05$) (Fig. 5). Nevertheless, we have to take into consideration the low number of sites with deep pockets (>7 mm).

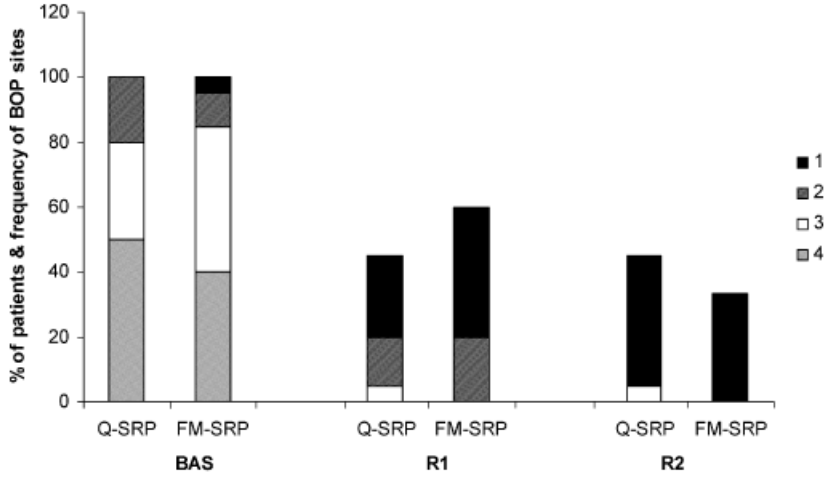

Fig. 2. Percentage of patients and the frequency of sites (from 1 to 4) that are bleeding on probing (BOP) positive in each treatment group. No statistically significant differences were noted between the Q-SRP and FM-SRP groups ($p>0.05$); Q-SRP = quadrant scaling and root planing; FM-SRP = full mouth scaling and root planing; BAS = baseline; R1 = reassessment 1; R2 = reassessment 2.

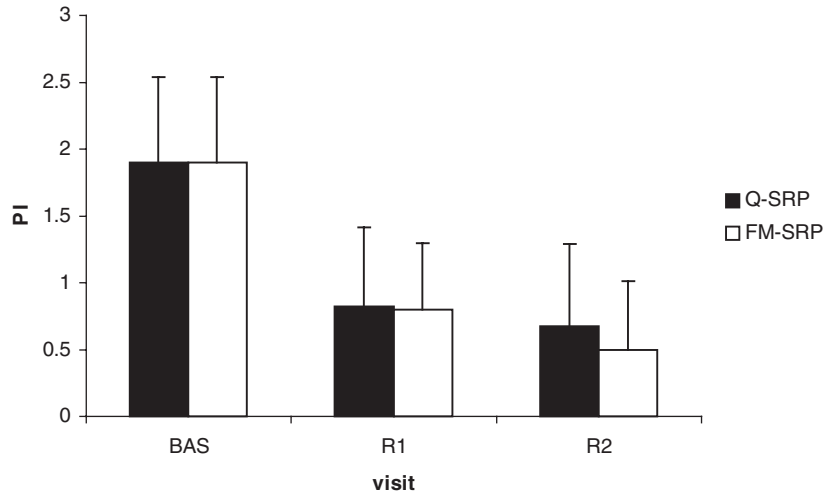

Fig. 3. Average (± standard deviation) plaque index (PI) for patients in the two treatment groups. No statistically significant differences were noted between Q-SRP and FM-SRP groups ($p>0.05$); Q-SRP = quadrant scaling and root planing; FM-SRP = full-mouth scaling and root planing; BAS = baseline; R1 = reassessment 1; R2 = reassessment 2.

Effect of partial periodontal therapy on the clinical indices of the remaining untreated quadrants in the Q-SRP group

The changes in clinical indices in quadrant 4 were analysed at the time interval between the initiation of therapy (baseline) and fourth scaling session, just before that quadrant was root planed (Fig. 6). A significant reduction in PD ($p=0.01$), SUP ($p<0.005$), MGI ($p<0.005$), and PI ($p<0.001$) was found at this time interval, indicating a ''spill over'' benefit from treatment of the other quadrants. It should be noted however, that at baseline SUP at the specific, more severely diseased sites, was high (60%) and interestingly, at visit 4 it seemed to decrease more dramatically from baseline than did BOP.

Patients' observations

The completed questionnaires revealed that FM-SRP resulted in significantly higher pain rating than Q-SRP (Table 5). No significant differences in body temperature were seen between the treatment groups 24 and 48 h after the first scaling session. However, a significantly higher percentage of FM-SRP patients took analgesics 24 and 48 h after instrumentation. The fact that higher pain scores and higher intake of analgesics was demonstrated for the FM-SRP group compared to the Q-SRP group agrees with the findings of Quirynen et al. (2000).

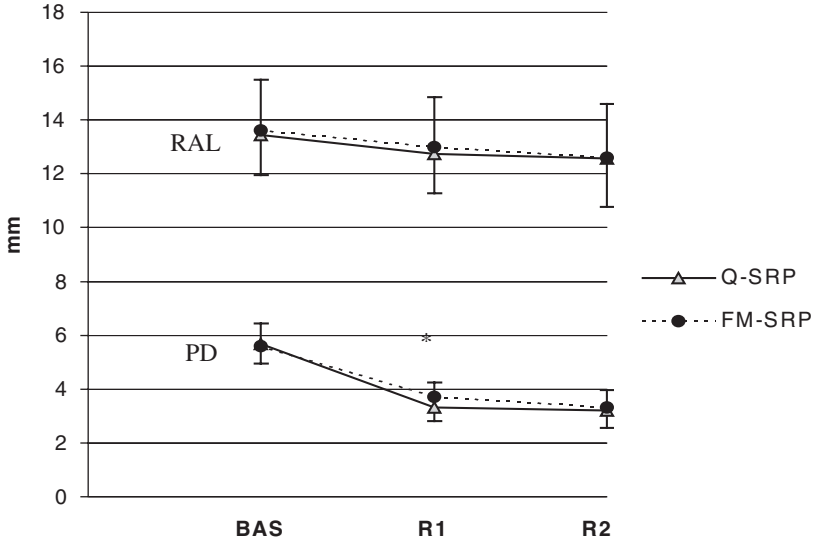

Fig. 4. Changes in pocket depth (PD) and relative attachment level (RAL) with therapy in moderately deep pockets (≥ 5 and < 7 mm) for each treatment group. $N_{Q\text{-}SRP} = 60$, $N_{FM\text{-}SRP} = 68$. BAS–R1: $\Delta PD = 2.3 \pm 1.0$; $\Delta RAL = 0.7 \pm 0.9$ for Q-SRP and $\Delta PD = 1.9 \pm 0.9$; $\Delta RAL = 0.6 \pm 0.8$ for FM-SRP. BAS–R2: $\Delta PD = 2.5 \pm 1.0$, $\Delta RAL = 0.9 \pm 0.9$ for Q-SRP and $\Delta PD = 2.3 \pm 1.0$, $\Delta RAL = 1.0 \pm 0.9$ for FM-SRP. $^{*}p < 0.05$; p-values represent differences between Q-SRP and FM-SRP groups; BAS = baseline; R1 = reassessment 1; R2 = reassessment 2; Q-SRP = quadrant scaling and root planing; FM-SRP = full mouth scaling and root planing.

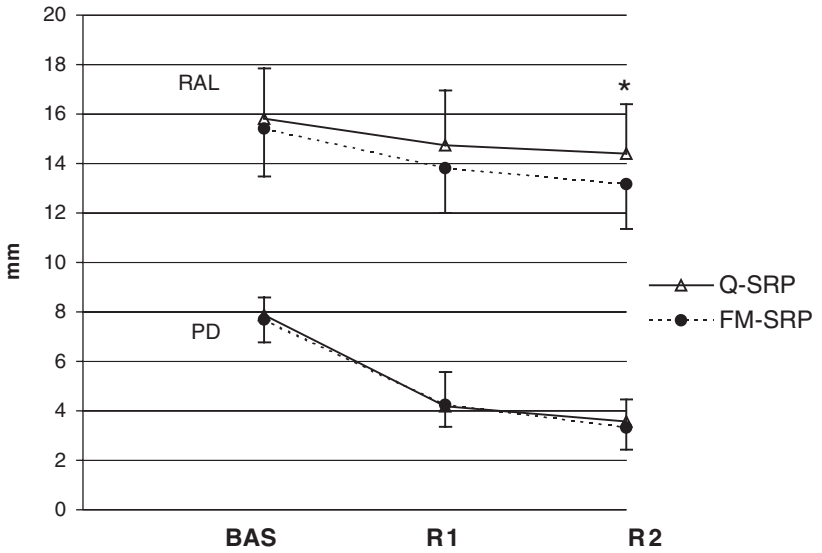

Fig. 5. Changes in pocket depth (PD) and relative attachment level (RAL) with therapy in deep pockets (≥ 7 mm) for each treatment group. $N_{Q\text{-}SRP} = 20$, $N_{FM\text{-}SRP} = 12$. BAS–R1: $\Delta PD = 3.7 \pm 1.7$, $\Delta RAL = 1.1 \pm 1.0$ for Q-SRP and $\Delta PD = 3.4 \pm 1.0$, $\Delta RAL = 1.6 \pm 1.0$ for FM-SRP. BAS–R2: $\Delta PD = 4.3 \pm 1.2$, $\Delta RAL = 1.4 \pm 0.8$ for Q-SRP and $\Delta PD = 4.4 \pm 1.3$, $\Delta RAL = 2.2 \pm 0.8$ for FM-SRP. $^{*}p < 0.05$; p-values represent differences between Q-SRP and FM-SRP groups; BAS = baseline; R1 = reassessment 1; R2 = reassessment 2; Q-SRP = quadrant scaling and root planing; FM-SRP = full mouth scaling and root planing.

Discussion

Marked improvements in all clinical indices were detected after both treatment modalities and the range of improvement in the clinical measurements is consistent with results from other studies (Ramfjord et al. 1975, Listgarten et al. 1978, Badersten et al. 1981, 1984a, b, Isidor et al. 1984). The present results indicated a continuous clinical improvement at 3 and 6 months and confirm previous findings of Badersten et al. (1984b). Sites were successfully treated with a single episode of instrumentation and no repeated deep scaling was performed up to the first 3 months of this study.

Same-day FM-SRP gave comparable clinical improvements to Q-SRP at 3 and 6 months. With respect to the selected-site analysis, although there was a greater PD reduction in Q-SRP group compared to FM-SRP group at R1, this difference was not maintained at the 6-month visit (R2). Features of the R1 visit differed between the Q-SRP and FM-SRP groups. The Q-SRP group as can be seen from the flow chart in Fig. 1 had the first quadrant scaled 12 weeks before the R1 visit. Although the last quadrant to be scaled was 6 weeks prior to R1, clearly the other quadrants were treated prior to this. The greater time after therapy translates to a greater time for healing and therefore one would expect the Q-SRP group on average to have better improvements at R1. The R2 data show no difference between Q-SRP and FM-SRP groups and this time point is the better comparison as differences in time between the two treatment groups after scaling are to some extent equilibrated. Therefore, conclusions should be drawn based on the R2 comparison.

When PD at the selected sites was considered (moderately deep or deep pockets), the smaller PD reduction noted for the FM-SRP group between baseline and R1 compared to the Q-SRP group was due to differences in the moderately deep pockets (> 5 and < 7 mm). This means that despite the uneven healing periods between the two treatment groups, FM-SRP resulted in similar PD reduction to Q-SRP at deep pockets. However at R2, FM-SRP resulted in a similar PD reduction but greater gain in RAL for deep pockets than Q-SRP, implying that at 6 months FM-SRP patients had less recession at deep pockets than Q-SRP patients. Although, gain in attachment in deep pockets is of great interest to the therapist, care should be taken in interpreting these results, due to the small number of sites deeper than 7 mm in this study.

With respect to the whole-mouth indices, differences at R1 were not evident due to the dilution effect of healthy sites, which makes differentiation of any two treatments difficult

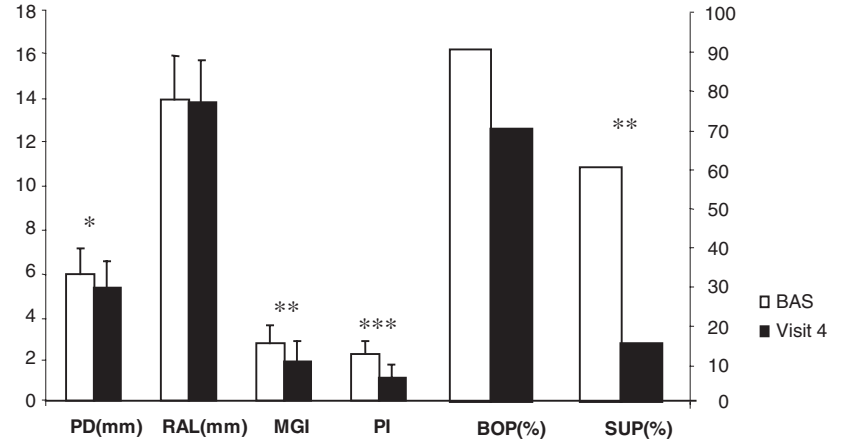

Fig. 6. Longitudinal changes for sites in quadrant 4 during the initial phase of treatment for the Q-SRP group (baseline to visit 4). At visit 4, sites in quadrant 4 were root planed. $^{*}p<0.01$; $^{**}p<0.005$; $^{***}p<0.001$; p-values represent longitudinal changes (BAS to visit 4) in the untreated sites of quadrant 4 for the Q-SRP group; PD = pocket depth; RAL = relative attachment level; MGI = modified gingival index; PI = plaque index; BOP = bleeding on probing; SUP = suppuration; Q-SRP = quadrant scaling and root planing; BAS = baseline.

Table 5. Patients' observations

	Q-SRP	FM-SRP
Pain rating (0–10)* day 1	2.0 (0.0–5.5)	3.0 (0.0–9.0)
Body temperature (°C)† day 1	36.7 ± 1.0	36.7 ± 0.6
Body temperature (°C)† day 2	36.5 ± 0.9	36.6 ± 0.6
No. patients > 38°C day 1	3.0	3.0
No. patients > 38°C day 2	2.0	1.0
No. patients/analgesics day 1	12.0	24.0
No. patients/analgesics day 2	2.0	13.0
No. analgesics* day 1	1.0 (0.0–6.0)	4.0 (0.0, 10.0)
No. analgesics* day 2	0.0 (0.0–4.0)	0.0 (0.0–8.0)
No. patients/labial herpes	1.0	2.0

Q-SRP = quadrant scaling and root planing; FM-SRP = full mouth scaling and root planing; no. = number.
*Median (min–max).
†Mean ± SD.

because healthy sites do not change much in either group. The selected-site indices are therefore preferred for comparisons. This is in agreement with Knowles et al. (1979) who reported that healing in shallow pockets has a major effect when computing patient means for change in PDs and dilutes the effects of treatment on deep pockets, which are of greatest concern to the therapist.

The effect of smoking on the comparison of the two treatment strategies over the 6-month study period was difficult to delineate. Although Q-SRP and FM-SRP appeared to be equally efficacious periodontal treatments as assessed by clinical indices, the benefits for non-smokers were better than for smokers. These findings suggest that smoking cessation protocols should have prominence in the management of smokers with periodontitis.

A series of clinical trials consistently found that the one-stage full-mouth disinfection is more efficacious than consecutive sessions of quadrant root planing at 2-weekly intervals (Quirynen et al. 1995, 2000, Vandekerckhove et al. 1996, Bollen et al. 1998, Mongardini et al. 1999). Greater PD reductions and attachment gains were seen for the FM-SRP group compared to the Q-SRP group, especially for deep pockets (Quirynen et al. 1995, Vandekerckhove et al. 1996). The present study showed the same magnitude of PD reduction in deep pockets between the two treatment modalities, but the gain in RAL was notably greater for the FM-SRP group at 6 months. This finding was despite the fact that full-mouth root planing was completed in 12 h rather than the 24 h seen in other studies (Quirynen et al. 1995, Vandekerckhove et al. 1996), with a potential of reducing the chances for bacterial translocation into the previously treated sites. In addition, the patients in the FM-SRP group were seen at equal time points and received equal amounts of OHIs to those that received Q-SRP. This resulted in similar plaque indices between the treatment groups throughout the study, which disagrees with the findings of Vandekerckhove et al. (1996) who showed higher plaque indices for the one-stage full-mouth disinfection group after the first month, possibly due to lack of frequent sessions of oral hygiene reinforcement. In contrast, other studies from the same research group found better plaque scores in the one-stage full-mouth disinfection than the Q-SRP treatment group post-therapy (Bollen et al. 1998, Mongardini et al. 1999).

Several reasons could account for the differences between the current study and the trials described above. In the latter studies, clinical measurements were collected from quadrant 1 only, even before Q-SRP therapy was completed. Therefore, the final clinical changes seen in the Q-SRP group may not have been revealed at this stage. It was interesting to note that no further PD reduction occurred in single-rooted teeth of the Q-SRP patients after 2 months, when root planing of the whole dentition was completed in contrast to the presently reported findings (Quirynen et al. 1995). In the current study, patients were reassessed 6 weeks after the completion of initial treatment and then 6 months after the initiation of treatment, and a continuous clinical improvement was evident during the monitoring period, reaching a plateau at 6 months. It should be emphasised that the disparity between the present investigation and the studies of Quirynen et al. (1995, 2000) is mainly due to

differences in the clinical outcome seen in the Q-SRP group. In the current study, PD reduction following Q-SRP treatment was remarkably greater than that found in the quoted studies.

Another difference in the methodology between the current study and that of Quirynen et al. (1995) is that this investigation examined the clinical outcome of conventional periodontal therapy consisting of quadrant versus full-mouth scaling and root planing and OHIs with no adjunctive use of antiseptics. The clinical results presented in the current study are not inferior to those reported by other studies which used antimicrobial agents adjunctive to mechanical debridement (Listgarten et al. 1978, Haffajee et al. 1988, Mombelli et al. 1996). Data from other studies agree that chlorhexidine does not augment the beneficial outcome of periodontal therapy (Braatz et al. 1985, MacAlpine et al. 1985, Wennström et al. 1987a, b), and when this does occur, it is a transient phenomenon rather than a long-term effect (Lander et al. 1986, Oosterwaal et al. 1991). We should stress though, that in the quoted studies chlorhexidine was used as a single measure of disinfection in contrast to the treatment protocol of multiple chlorhexidine applications used in the Leuven studies (Quirynen et al. 1995, 2000, Vandekerckhove et al. 1996, Bollen et al. 1998, Mongardini et al. 1999).

Bollen et al. (1998) showed that the extended and prolonged use of chlorhexidine in the one-stage full-mouth disinfection resulted in additional improvements both clinically and microbiologically, to those reported in previous studies (Quirynen et al. 1995). Nevertheless, this finding is in disparity with more recent data from the same research group, which showed that no significant differences in any clinical index existed between patients who received full-mouth root planing, with or without the use of chlorhexidine, and that the clinical outcome of these treatments was superior to that of quadrant root planing at 2-weekly intervals (Quirynen et al. 2000). The authors concluded that the role of chlorhexidine in the beneficial effects of the one-stage full-mouth root planing is not critical, implying that a host-induced effect and/or gross microbial removal at one-stage could contribute to the superior clinical outcome seen after this treatment strategy. Although, the authors questioned the importance of chlorhexidine in the one-stage full-mouth disinfection concept, further studies are required to clarify the role of combined modes of chlorhexidine therapy in the full-mouth treatment approach (i.e. full-mouth chlorhexidine disinfection with no root planing). It must be noted however, that in this investigation (Quirynen et al. 2000), three groups of patients were examined, but two of the groups participated and received treatment in an earlier trial by the same investigators (Mongardini et al. 1999, Quirynen et al. 1999). The third group of patients (FM-SRP with no use of chlorhexidine) was recruited later and although the assessment of patients in this group started in the middle of the previous study, this could have resulted in biased data collection, specially when tooth staining due to the use of chlorhexidine is taken into account.

It was of interest to note that partial periodontal therapy, which occurred in the course of quadrant root planing at 2-weekly intervals, resulted in improved clinical conditions in the remaining untreated quadrants, in terms of PD, SUP, gingival and plaque indices reductions. This finding is likely to be the result of improved plaque control in highly motivated periodontitis patients and/or host-induced effects during the active phase of treatment and/or a Hawthorne effect.

Conclusion

The current study failed to demonstrate any significant differences in the clinical outcome between Q-SRP at 2-weekly intervals and same-day FM-SRP at 6 months. Despite the fact that FM-SRP resulted in higher pain scores and greater intake of analgesics, this treatment approach was well tolerated by patients. In conclusion, the clinician should select the treatment modality based on practical considerations related to patient preference and clinical workload.

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