Scaling and Root Planing with Concomitant Subgingival Curettage

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I. Introduction

Elimination of inflammation and preservation of dentition are the primary goals of periodontal therapy. Non-surgical therapy consisting of oral hygiene, scaling and root planing(SRP) has been consistently shown to be one of the most effective means of treating periodontal disease[1-10]. Actually, for 4-6 mm probing depth, scaling, root planing and curettage showed better attachment results than pocket elimination surgery[1]. Non-surgical therapy results in probing depth reduction with a gain of attachment levels and this clinical improvement is associated with qualitative changes in the subgingival microbiota[11].

Subgingival curettage was used frequently as an adjunct to scaling and root planing in the treatment of suprabony pockets[12]. It attempts removal of the inflamed epithelial lining of the pockets and the underlying granulomatous connective tissues with a curette. In case of suprabony pockets, gingival curettage results in gingival shrinkage and the probing depth is reduced[13].

Clinical effects of concomitant scaling and root planing and gingival curettage had been evaluated before[14], but the microbiological effects of this treatment modalities have not been elucidated.

The objective of this study was to compare the effects of concomitant subgingival curettage and root planing on clinical and selected microbiological parameters of two treatment groups in patients with moderate adult periodontitis.

II. Materials and methods

1. Subjects

Patients admitted to the Department of Periodontology, Seoul National University Dental Hospital were selected for this study. After explaining the investigative purpose and protocol to all volunteers, written consent was obtained from each subject in accordance with guidelines established by the committee on the use of human subjects in dental research at the Seoul National University Hospital. 14 patients constituted the final subject population. There were 5 males and 9 females. Their age ranged from 30 - 58 years, with a mean of 45.5 ages. A total of 302 teeth was studied.

2. Experimental design

The experimental design is illustrated in Figure 1. Patients were evaluated for the study after an initial screening visit in which a prophylaxis was performed to remove all supragingival plaque and calculus, thereby reducing the potential impact of gingivitis on the outcome of therapy[15].

At baseline, 2 to 3 weeks later patients selected at the screening visit were enrolled in the study if they met following inclusion criteria:

1) be at least 21 years of age
2) have at least 20 teeth
3) have generalized moderate adult periodontitis
4) have no systemic disease
5) have no history of anitibiotic therapy and periodontal therapy in the previous 3 months

Prior to treatment, teeth were randomly assigned by quadrants to one of the two treatment modalities. Two treatment visits were scheduled, each comprising of SRP on one side of the mouth and SRP with adjunctive subgingival curettage on the opposite side. Subgingival curettage was used to remove the altered epithelial lining and chronic underlying inflammatory tissues from the two contralateral quadrants. Each stroke of the curette was repeated several times until a smooth connective tissue surfaces was believed to be present and no further tissue could be removed from the pocket. Occasionally, it was necessary to apply external finger pressure to ensure the desired removal of tissues. The time taken to complete each quadrant was approximately 30-40 minutes. We prescribed 1 bottle of 0.1% chlorhexidine gluconate solution for oral gargle(Daewoong Pharmacy, Seoul, Korea). Patients were also instructed in proper home care procedures, which were reinforced at each treatment visit. Subjects also received full mouth maintenance scaling with re-evaluation at 1, 3 months post-therapy. All measurements were performed by the author at all visits for all subjects.

3. Clinical evaluation

Subjects were clinically monitored prior to therapy and at 1, 3 months post-therapy. The following indices and measurements were recorded. Probing depth and gingival recession was measured to the nearest millimeter using calibrated periodontal probe at 6 sites per tooth excluding 3rd molars. Bleeding on probing was recorded as present or absent at the time of probing. Gingival index[16] and Plaque index[17] were scored from each tooth.

Tooth mobility was measured with Periotest (Siemens AG, Bensteim, Germany). The subjects were requested to maintain the mouth in rest position during the measurement.

4. Microbiological examination

Subgingival bacterial samples were collected from

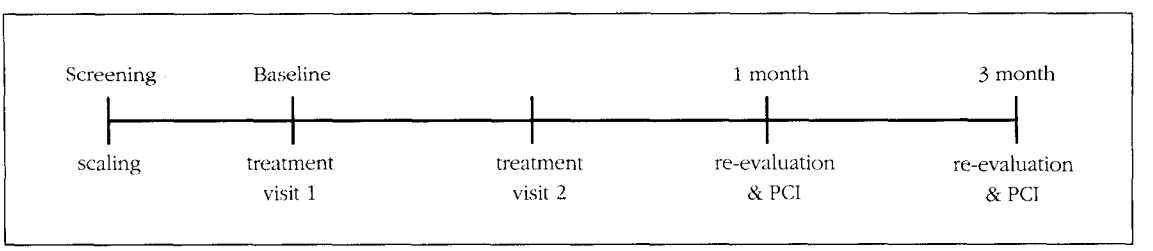

Figure 1. Experimental procedure

the deepest sites with a sterile periodontal curette. After careful cleaning and drying of the supragingival area, the curette was inserted to the bottom of the pocket, placed in contact with the root surface and subsequently moved coronally with a single stroke.

The sample thus obtained was suspended in a vial containing 0.6 ml prereduced transport medium VMGA III[18]. 1 drop of the suspension was applied to a microscopic slide, overlayed by a cover-slip and examined by darkfield microscopy(Olympus BH-2, Dental Scientific System Inc. Virginia, USA) at a magnification of 400x. The suspension remaining in the vial was prepared for cultivation by diluting to 3ml with pre-reduced transport medium.

Cultivation was performed within 60 minutes after sampling. The vial, which contained around 3-4 glass beads of 1-2 mm in diameter, was shaken for 30 seconds in Vortex mixer. 1 ml of the transport medium was diluted to 10^{-2} and 10^{-4} in VMG I[18] and thoroughly mixed in tubes. From the last dilution, 0.1 ml was taken and evenly distributed on the surface of a Brucella agar plate(BBL Microbiology System, Cockeysville, MD) enriched with 5 % defibrinated horse blood, 0.5 % hemolysed blood and 5 $\mu g/ml$ menadione. After 7 days incubation in anaerobic chambers(Anaerobic system 1024, Forma Scientific, Marietta, Ohio, USA), the total viable count was calculated. The black pigmented colonies, confirmed by gram stain as gram-negative rods, were calculated as Black-pigmented *Bacteroids*. Darkfield counts were obtained as described by Listgarten and Hellden[19]. Darkfield results were computed as percentage distribution of 4 phenotype: cocci, non-motile rod, motile rod, spirochetes.

5. Statistical analysis

The results were analyzed with SPSS 7.5 software. Changes in clinical measurements were analyzed using parametric procedures on a subject basis. Paired *t*-test was used to compare means between groups, and between each interval and baseline. The results are regarded as statistically significant when P value is smaller than 0.05 level.

Since microbiologic data were often non-normal[20], non-parametric tests were used to analyze these results. The procedure adopted was the Wilcoxon signed rank test.

III. Results

1. Clinical evaluation

Pocket depth(PD) At the baseline, the mean probing depths were 3.07 mm for the scaling and root planing with subgingival curettage(CU) group and 2.99 mm for the scaling and root planing(SRP) group with no significant differences between the groups($P>0.05$)(Table 1, Figure 2). The mean probing depths at months 1 and 3 were 2.38 mm and 2.31 mm for the CU group and 2.32 mm and 2.30 mm for the SRP group respectively. The significant reductions in probing depths occurred with both treatments on months 1 and 3, when compared to the baseline level.($P<0.05$) But, there were no significant differences between the two groups($P>0.05$).

Gingival recession (GR) The mean initial gingival recessions were 0.26 mm for the CU group and 0.25 mm for the SRP group with no significant difference between the groups($P>0.05$)(Table 1, Figure 3). The mean gingival recessions at month 1 and 3 were 0.58 mm and 0.47 mm for the CU group and 0.53 mm and 0.51 mm for the RP group respectively. The significant increases in gingival recession occurred with both treatments at months 1 and 3,

Table 1. Probing depth, Gingival recession, Clinical attachment level

		Baseline	1 month	3 month
PD				
	SRP+CU	3.07(0.45)	2.38(0.39)*	2.31(0.25)*
	SRP	2.99(0.43)	2.32(0.38)*	2.30(0.30)*
GR				
	SRP+CU	0.26(0.22)	0.58(0.40)*	0.47(0.36)*
	SRP	0.25(0.22)	0.53(0.43)*	0.51(0.42)*
CAL				
	SRP+CU	3.33(0.61)	2.92(0.52)	2.78(0.31)
	SRP	3.24(0.55)	2.85(0.55)	2.81(0.44)

* Paired t-test ($P<0.05$), values of standard deviation: in parenthesis

when compared to the baseline level($P<0.05$). But, there were no significant differences between the two groups($P>0.05$).

Clinical attachment level(CAL) At the baseline, the mean clinical attachment levels were 3.33 mm for the CU group and, 3.24 mm for the SRP group, with no significant difference between the groups ($P>0.05$)(Table 1, Figure 4). The mean clinical attachment levels at months 1 and 3 were 2.92 mm and 2.78 mm for the CU group and 2.85 mm and 2.81 mm for the SRP group respectively. For both groups, there were no significant differences in the means between baseline and any examination interval($P>0.05$). There were no significant differences between the two groups($P>0.05$).

Gingival Index(GI) The mean initial GI values were 0.60 for CU group, 0.64 for SRP group with no significant difference between the groups($P>0.05$). GI ratings decreased to 0.13, 0.14 respectively at month 1, and to 0.17, 0.18 at month 3 with significant differences compared to baseline($P<0.05$) (Table 2, Figure 5).

Bleeding on probing (BOP) 3.00 % for CU group and 2.82 % for SRP group showed bleeding sites on probing at the baseline examination. Significance testing revealed that both treatments were effective in reducing the number of sites which bled on prob-

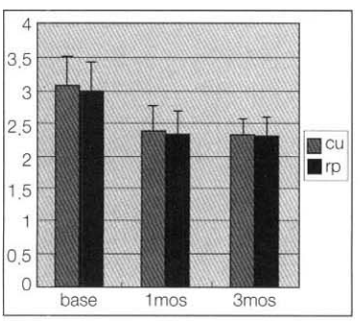

Figure 2. Probing depth

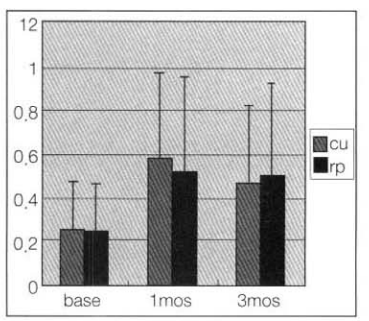

Figure 3. Gingival recession

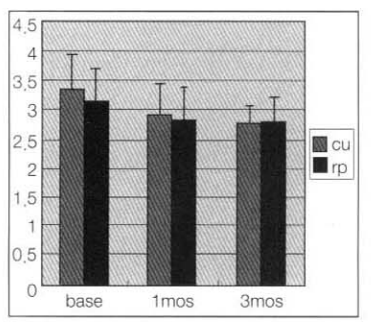

Figure 4.Clinical attachment level

Table 2. Ginigval index, Bleeding on probing

	Baseline	1 month	3 month
GI			
SRP+CU	0.60(0.30)	0.13(0.12)*	0.17(0.10)*
SRP	0.64(0.38)	0.14(0.17)*	0.18(0.16)*
BOP			
SRP+CU	3.00(1.83)	1.00(1.50)*	0.83(0.50)*
SRP	2.82(3.16)	0.67(1.00)*	0.83(0.67)*

* Paired t-test ($P<0.05$), values of standard deviation: in parenthesis

ing when compared to

the baseline($P<0.05$). There were significant differences in the means between baseline and both examination interval for both treatment groups($P<0.05$) (Table 2, Figure 6).

Plaque Index(PI) Initially, the PI scores were 0.77 for CU group and 0.91 for SRP group. These scores decreased significantly to 0.28, 0.21 respectively at 1 month, but increased again to 0.56, 0.42 at 3 months for both groups. These findings may reflect non-strict oral hygiene maintenance(Table 3, Figure 7).

Tooth Mobility At the baseline, the mean mobility values were 7.07(PTV) for the CU group and 5.11 for the SRP group with no significant differences between the groups(Table 3, Figure 8). These scores decreased to 6.23, 3.50 respectively at 1 month, but increased again at 3 months for both groups. There were no significant differences in the means between baseline and any examination interval($P>0.05$). There were also no significant differences between the two groups($P>0.05$).

2. Microbiological examination

Percent Black-pigmented Bacteroides The mean baseline percentages of BPB were 13.54 for CU group, 17.28 for SRP group. At 1 month, the percentages of BPB were reduced significantly by both treatments, and in the CU group, statistically significant reduction was observed than in the SRP

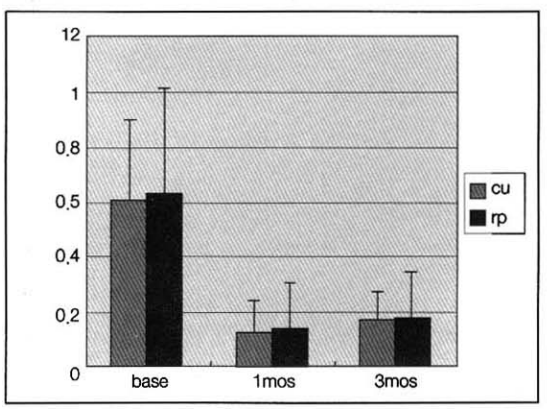

Figure 5. Gingival index

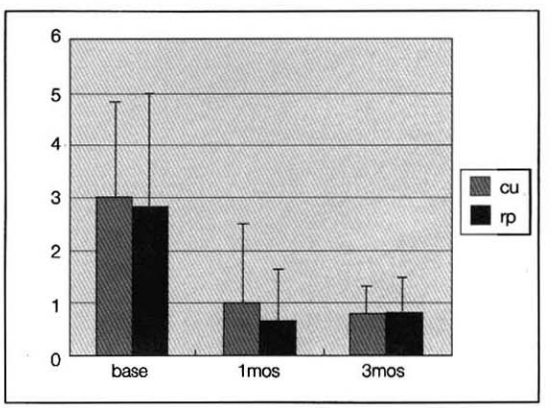

Figure 6. Bleeding on probing

Table 3. Plaque index, Tooth Mobility(PTV)

		Baseline	1 month	3 month
PI				
	SRP+CU	0.77(0.08)	0.28(0.21)*	0.56(0.08)*
	SRP	0.91(0.08)	0.21(0.28)*	0.42(0.08)*
Mob				
	SRP+CU	7.01(1.89)	6.23(3.71)	6.93(2.87)
	SRP	5.11(3.57)	3.15(2.24)	5.11(2.94)

*Paired t-test(P〈0.05), values of standard deviation: in parenthesis

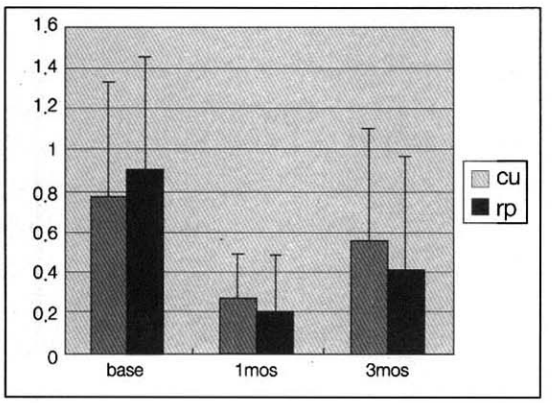

Figure 7. Plaque index

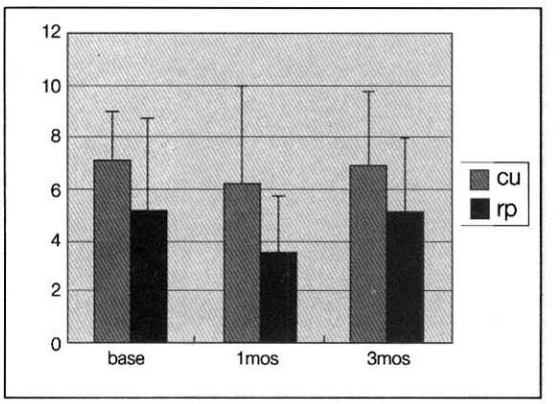

Figure 8. Mobility

Table 4. % Black-pigmented Bacteroides

	Baseline	1 month	3 month
% Black-pigmented *Bacteroids*			
SRP+CU	13.54	0.18*┐†	3.04*
SRP	17.28	1.13*┘	8.14

*, †: Wilcoxon signed ranks test(P〈0.05).

group(P〈0.05). At 3 month, significant reduction was found in only CU group when compared to baseline(P〈0.05) (Table 4).

Darkfield microscopy There was no significant difference between the two groups regarding the composition of the subgingival microbiota(Table 5).

Samples of subgingival bacteria obtained at baseline contained 50 - 56 % motile bacteria and 44 - 50 % non-motile bacteria. The composition of the subgingival microbiota did not significantly differ at the start of the study(P〉0.05). After subgingival debridement, the percentages of motile bacteria decreased significantly to 15 - 18% for both the treatments

Table 5. Mean % of morphotypes

	Baseline	1 month	3 month
Cocci+non-motile rod			
SRP+CU	44.12	81.96*	54.43
SRP	49.38	83.66*	55.45
Motile rod+spirochetes			
SRP+CU	55.88	18.04*	45.57
SRP	50.62	15.38*	44.55

* : Wilcoxon signed ranks test ($P<0.05$).

($P<0.05$). However, at 3 month, these percentages increased again to about 45% and did not significantly differ with baseline percentages($P>0.05$).

IV. Discussion

The results of this study showed clearly a significant clinical improvement in the periodontal condition of subjects after treatment in both CU group and SRP group. We also found that the recolonization of pathologic bacteria can be suppressed with both treatments and there is some difference in response to two treatment modalities.

At the baseline, the mean probing depth values were 3.07 mm for CU group, 2.99mm for RP group. These values can be thought to be somewhat small from moderate adult periodontitis patients, however initial probing depth reduction by supragingival scaling during screening visit could account for these results. Probing depth reduction measured 1 month after treatment were 0.69mm, 0.67mm respectively. These values were in general agreement with findings previously reported from studies evaluating the effects of non-surgical therapy[21-23]. Also, additional probing depth reduction during the last period of monitoring were minimal. This phenomenon also mirrors results from other studies[24].

The amount of GR increase after subgingival curettage were larger than that after RP only. It seems that elimination of inflammatory tissues during subgingival curettage results in more gingival shrinkage. However, the changes in CAL were not remarkable as those in probing depth or GR. This might be related to the fact that probing depth reduction and GR increase were intermingled, because CAL was calculated by addition of probing depth values to GR values rather than measured this directly.

In both groups, gingival inflammation had been resolved significantly after 1 month, and this results can be identified by both BOP and GI scores. However, there was a recurrence of gingival iflammation after initial decrease. We speculated that incomplete plaque control accounts for these findings. In this study, no further visits for plaque control instruction were scheduled after treatment visit.

BOP has been commonly used as a diagnostic criterion for periodontal diseases.[25-26] The BOP values were reduced from 3.00%, 2.82%(baseline) to 1.00%, 0.67%, i.e., 67%(CU), 76%(RP) reduction, respectively. The corresponding reductions of the GI scores were about 0.47, 0.50units. This marked decrease in gingival inflammation following treatment was in agreement with findings previously reported[27-29]. The reduction of BOP was less pronounced in subgingival curettage than in RP. This

slower resolution could be explained by delayed healing in tissues treated by subgingival curettage due to inevitable trauma during treatment. Actually, some subjects complained of gingival pain and bleeding in quadrants treated with subgingival curettage.

Bacterial plate counts were characterized by high degree of variability due largely to sampling.[20] To overcome the variability, the ratio of BPB counts to total plate counts were used instead of number of colonies. BPB, particularly *P. gingivalis* and *P. intermedia* have been recognized as probable periodontal pathogens[30]. Their eradication from periodontal sites has proven difficult[31,32]. However, both treatments reduced BPB significantly in this study, and these results were consistent with other studies[33-36]. The most conspicuous observation made in this study was that the differences in BPB percentage between the groups were noticeable at 1 month. In addition, in CU group only, the decrease in the level of percent BPB remained significant throughout the study. In general, like other bacteria, the repopulation time of these species was known to 60-80 days. These remarkable results could have relation to the fact that subgingival curettage made more definite alteration in microbial environment.

Like other studies[34,36], the decrease in level of motile bacteria percentages was remarkable at 1 month in both groups, however this rebounded to nearly baseline level likewise corresponding Plaque index scores. It can be surmised that there are some relationships between the level of motile bacteria percentage and Plaque index. Several investigations have focused on the relationship of supragingival plaque to post-treatment recolonization of subgingival plaque[37-42]. Microbial repopulation in subgingival pockets can be severely inhibited by continual and effective oral hygiene[38-41,42]. The presence of a supragingival microbial plaque appears to facilitate repopulation of subgingival pockets within 4 to 8 weeks, including high percentages of spirochetes and motile rods[36,38,39,43,44].

To date, many issues had been suggested about subgingival curettage. One of them is the predictability of that procedure. Regarding the validity of subgingival curettage, Orban contended that it was almost impossible to accomplish complete removal of the sulcus epithelium from the pocket.[45] Waerhaug stated that such removal was altogether impossible[46]. Sanderson observed the presence of epithelium in the surface of the pocket in only 47% of hand-curetted areas[47]. Likewise, we are unsure if complete removal is possible.

The other issue is the superiority of this procedure to the other ones. In earlier reports, it had been contended that new attachment by connective tissue had been contended[48,49], however these comments were denied later. Caton, utilizing a nonhuman primate model, said that the coronal attachment of gingival tissue to the root surface appeared to result from formation of a long junctional epithelium rather than new connective tissue attachment[50].

Some advantages from the elimination of sulcular epithelium were underestimated by the evidences that the long junctional epithelium was enough to resist the recurrence of inflammation if proper plaque control was maintained. The barrier function of a long junctional epithelium against plaque infection is not inferior to that provided by a dentogingival epithelium of normal length[51]. Long junctional epithelium adhesion has the ability to retain its position on the tooth surface over long periods[52].

In this study, the recolonization of some pathogenic bacteria was more delayed in quadrants treated with subgingival curettage than those treated by root planing only. Although we do not know how to account for these results, we surmised that these results could show some advantages of adjunctive

subgingival curettage to root planing. However, a more definite, well-controlled study is needed to clarify this phenomenon.

V. Conclusion

The objective of this study was to compare the effects of concomitant subgingival curettage and root planing on clinical and selected microbiological parameters of two treatment groups in patients with moderate adult periodontitis. The results were as follows:

1. There were significant changes in probing depth and gingival recession at 1 month ($P<0.05$), and these changes remained through 3 month. However, no significant differences were observed between two groups($P>0.05$).
2. There were also significant reductions in gingival index and bleeding on probing at 1 month($P<0.05$), and these reduced levels were maintained through 3 month with no significant differences between two groups($P>0.05$).
3. In both groups, motile bacteria decreased significantly at 1 months($P<0.05$), but increased nearly to baseline level at 3 month.
4. The percentages of Black-pigmented *Bacteroides,* in both groups, decreased significantly at 1 month($P<0.05$), and in the subgingival curettage group, significant more reductions were observed than in the root planing group($P<0.05$). At 3 month, significant reduction was found in subgingival curettage group only($P<0.05$).

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-Abstract-

Scaling and Root Planing with Concomitant Subgingival Curettage

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Non-surgical therapy is still an important technique in periodontal treatment. In this study, scaling and root planing(SRP) with or without concomitant subgingival curettage were compared clinically and microbiologically. 14 moderate adult periodontitis patients were included in this study. After 2 weeks from screening visit, with split mouth design, one quadrant was treated by SRP, and the opposite side was treated by SRP with subgingival curettage.

Clinical measurement and microbiological analysis was taken at baseline, 1 month, 3 month post-treatment. Clinical parameters used in this study was probing depth, gingival recession, gingival index, bleeding on probing, plaque index, tooth mobility(Periotest Value). Microbiological analysis consisted of determination of the percentages of 4 bacterial groups according to morphologic type with phase-contrast microscope and measuring Black-pigmented *Bacteroides* after anaerobic culture.

1. There were significant changes in probing depth and gingival recession at 1 month($P<0.05$), and these changes remained through 3 month. However, no significant differences were observed between two groups($P>0.05$).
2. There were also significant reductions in gingival index and bleeding on probing at 1 month($P<0.05$), and these reduced levels were maintained through 3 month with no significant differences between two groups($P>0.05$).
3. In both groups, motile bacteria decreased significantly at 1 months($P<0.05$), but increased nearly to baseline level at 3 month.
4. The percentages of Black-pigmented *Bacteroides*, in both groups, decreased significantly at 1 month($P<0.05$), and in the subgingival curettage group, significant more reductions were observed than in the root planing group($P<0.05$). At 3 month, significant reduction was found in subgingival curettage group only($P<0.05$).

According to these results, we surmised that concomitant subgingival curettage and root planing give some advantageous effect on bacterial recolonization.

Key words : root planing, subgingival curettage, Black-pigmented *Bacteroides*