

# Improvement of Periodontal Parameters in Untreated site After Periodontal Surgery at Adjacent sites

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**ABSTRACT:** The aim of this study was to find out whether surgical treatments performed on each quadrant would have any influence on the periodontal status of the untreated quadrants. 25 patients with severe chronic periodontitis were selected and received full-mouth scaling and root planning. After 8 weeks, quadrant-wise surgery was performed during four consecutive sessions at 2-week intervals for sites with probing pocket depth (PPD)>5 mm and bleeding on probing (BOP). Clinical parameters including PPD, BOP, and clinical attachment level were recorded at baseline, session prior to surgery, and 8 weeks after last surgical visit. The mean PD of pockets>3mm was reduced from 4.09±1.32 mm at baseline to 1.37±0.87 mm at the end of the study. Although the data from visit six (8 weeks after surgery in quadrant four) showed significant differences compared to those from all other visits. Pockets with a baseline depth of 5 mm >PPD>3 mm, 7 mm> PPD≥ 5 mm, and PPD≥7 mm showed reductions from 3.55±0.35 mm, 4.17±0.22 mm, 7.19±0.54mm, respectively, at baseline to 1.18±0.97 mm, 1.35±0.50 mm, 2.64±0.38 mm, respectively, at the end of the study. Overall, mean PAL improved from 4.13±1.37 mm to 3.35±0.83 mm at visit five and decreased slightly to 3.05±0.34 mm after the last visit. BOP decreased from 88.65%±25.25% at baseline to 8.97%±10.67% at the end of study. There was a marked difference between the BOP scores of visits one, two, and three and those of visits four and five. Also, a remarkable difference was observed between the BOP scores of visit six and those of other visits. The treatment plan made at the time of reassessment of the initial phase of therapy should be considered provisional, and it should be open to revision prior to each surgical visit to reconfirm or modify the treatment plan previously devised for the remaining quadrants.

**Keywords:** Periodontitis, Root planning, Surgery, Therapy.

## INTRODUCTION

Dental plaque is considered the primary etiologic factor for periodontitis, and there is considerable scientific evidence supporting the importance of its removal in maintaining a healthy periodontium. Clinical trials (1, 3, 4), Revealed that meticulous scaling and root planning (SRP), in conjunction with proper plaque control by the patient, can arrest periodontitis. The clinical benefits of SRP are due to biofilm disorganization and calculus removal, resulting in the decrease of periodontal pathogens and reestablishment of a microbiota compatible with health (3, 5). Surgical treatment modalities are indicated when initial treatment fails to halt disease progression and probing depths PDs >5 mm as well as bleeding on probing (BOP) persist. This treatment planning strategy is based on the presumption that upon completion of the initial phase of therapy, an initial marked reduction in PD and attachment level occurs within the 6 to 8 weeks following treatment, with only minor changes occurring afterward. This has been documented by the data of several studies (3, 7), evaluating SRP. However, in this type of treatment- planning strategy, it is

presumed that throughout the surgical treatments of diseased sites no significant change in the clinical parameters of the other diseased, yet surgically untreated, sites will occur. Several studies (3, 10) documented that a strong serum antibody response may be observed following mechanical non-surgical and surgical periodontal treatment. Theoretically, this increased antibody response and avidity, together with the effect of reduced antigenic load at the treated sites, may benefit the surgically untreated sites. To the best of our knowledge, no data exist on the magnitude of such change in the clinical periodontal parameters of the surgically untreated sites as a result of surgical treatment of adjacent sites. The purposes of this study were to address whether surgical treatments performed on each quadrant would have any influence on the periodontal parameters of the yet untreated quadrants and whether the patient should be subjected to periodontal reassessment prior to every surgical visit to reconfirm or modify the treatment plan devised for the remaining quadrant(s).

## MATERIALS AND METHODS

### **Study Population:**

Initially, 30 patients (age range: 22 to 61 years; 16 females and 14 males) were recruited from first-time referrals to the Periodontics Department, Hamadan School of Dentistry, in 2012. They underwent a full course of SRP. Eight weeks after this course, they were evaluated by examiner (15, 16).

The patients were included in the study if, at this stage, they had 5 mm PPD and BOP in area on each quadrant, confirming a need for full-mouth surgical pocket elimination (17). Also, a plaque index score 20% was a prerequisite to enter the study. Exclusion criteria included smoking, any systemic diseases known to affect the result of periodontal treatments, any previous periodontal therapy, and the use of antiseptic mouth rinses or antibiotics within 6 months prior to entry into the study. 28 patients met all the requirements and entered the study at this stage. This research was approved by the Ethics Committee of the Hamadan University of Medical Sciences, and all subjects were informed about the purpose of the study and signed informed consent forms (18, 19). Study Design and Clinical Measurements At the screening visit for recruitment, baseline clinical parameters, including BOP, PD, and probing attachment level (PAL), were recorded for all teeth, excluding third molars (20, 21 and 22). Full-mouth SRP, was performed in two sessions; 1hour each. Before leaving, each individual received instructions regarding proper home care procedures. After 8 weeks, the patients were recalled, and post- SRP clinical measurements were repeated. 25 subjects were entered into the study at this point. These patients, despite mechanical therapy and satisfactory oral hygiene, had at least one periodontal pocket 5 mm in each quadrant, as well as BOP. These patients received quadrant-by-quadrant surgery on a randomized basis over four consecutive sessions at 2-week intervals. The surgery included reflection of periodontal flaps, removal of granulation tissue, and meticulous debridement of the root surfaces. Osteoplasty of gross osseous defects was accomplished where indicated. The flaps were sutured with interrupted silk sutures and covered with periodontal dressings. Gelofen (ibuprofen 400 mg) was prescribed for the patients as an analgesic. Neither anti-septic mouth rinses nor antibiotics were prescribed after surgeries, and sutures were removed after 7 days. Periodontal measurements were repeated for the quadrant to be treated last (designated as quadrant four) in each session prior to surgery and 8 weeks after the last surgical visit. Measurements from teeth requiring extraction during the study were not included in the analyses. PPD and PAL were recorded at six points around each tooth using a Williams's manual periodontal probe. In addition, the presence of BOP was recorded after running a probe inside the sulcus horizontally, producing two scores for each tooth: one for the buccal aspect and another for the lingual aspect. for the last-treated quadrant (1, 2), a dataset was available consisting of six visits: visit one represented the periodontal status of the last-treated quadrant at baseline; visit two represented the last-treated quadrant 8 weeks post-SRP; visits three through five represented the periodontal status of the last-treated quadrant following the pocket-elimination surgery on quadrants one through three, respectively; and visit six represented the periodontal status of the last-treated quadrant 8 weeks following the end of the surgical treatments. All examinations were performed by a single examiner (1, 2 and 3).

### **Statistical Analysis:**

To analyze data used software SPSS16 (significant test level was 5%) and the repeated measures (ANOVA) or parametric equation was used, for multiple comparisons LSD test was used.

## RESULTS AND DISCUSSION

### **Results**

#### **PPD**

The mean PD of all pockets >3mm was reduced from  $4.09 \pm 1.32$  mm at baseline to  $1.37 \pm 0.87$  mm at the end of the study. Although the data from visit six (8 weeks after surgery in quadrant four) showed significant differences

compared to those from all other visits, no marked difference existed between visits one and two; visits two and three; and visits three, four, and five. Pockets with a baseline depth of 5 mm > PD>3 mm, 7 mm > PD≥ 5 mm, and PD≥7 mm showed reductions from 3.55±0.35 mm, 4.17±0.22 mm, 7.19 ±0.54mm, respectively, at baseline to 1.18 ±0.97 mm, 1.35 ±0.50 mm, 2.64±0.38 mm, respectively, at the end of the study. Pockets with a baseline depth of 5 mm > PD >3 mm showed a significant reduction between all visits. Pockets with a baseline depth of 7 mm > PD ≥5 mm showed significant changes between all visits, except between visits four and five. Finally, in pockets with baseline PD ≥7 mm, although each pair of subsequent visits was not significantly different, the data collected at each visit were markedly different from that collected from two visits previously (Table 1).

Table 1. Mean±standard deviation of PPDs at several visits

Visit	PPD>3 mm	5mm>PPD>3mm	7mm>PPD≥ 5mm	7mm≥ PP
baseline	4.09 ± 1.32	3.55±0.35	4.17±0.22	7.19 ±0.54
8 weeks post-SRP	3.55 ±1.08	2.56 ±0.77	5.44 ±0.42	6.83 ±0.57
2 weeks after surgery at quadrant 1	2.47±0.38	3.63 ±0.65	3.19 ± 1.52	5.74±1.87
2 weeks after surgery at quadrant 2	2.77 ±0.85	2.18 ±0.53	2.95 ±0.67	5.10 ±01.46
2 weeks after surgery at quadrant	2.37 ±0.87	1.85 ±0.38	2.49 ±0.84	5.50 ±1.82
8 weeks after surgery at quadrant 4	1.37±0.87	1.18 ±0.97	1.35 ±0.50	2.64±0.38
P value	<0.001	<0.001	<0.001	<0.001

P<0.05 was considered statistically significant.

**PAL**

PAL generally improved throughout the treatment period, with a mild attachment loss after visit six. Overall, mean CAL improved from 4.13± 1.37 mm to 3.35±0.83 mm at visit five and decreased slightly to 3.05 ±0.34 mm after the last visit. Mean PAL for the PPD categories of 5 mm > PPD >3 mm, 7 mm > PPD ≥5 mm, and PPD ≥7 mm were 3.50 ±0.85mm, 5.38 ±0.63mm, 7.84 ±1.68mm respectively at baseline ,and 2.52±0.35 mm, 3.31±0.64 mm, 4.66 ±0.87mm, respectively, after visit six (Table 2).

Table 2. The effect of PAL on Mean±standard deviation of PPDs at several visits

Visit	All Sites (PPD >3 mm)	5 mm > PPD >3 mm	7 mm> PPD≥ 5mm	7 mm ≥ PPD
baseline	4.13± 1.37	3.50 ±0.85	5.38 ±0.63	7.84 ±1.68
8 weeks post-SRP	3.68 ±1.57	3.61 ±0.27	4.256 ±0.66	6.64 ±0.57
2 weeks after surgery at quadrant 1	3.46 ±0.32	3.43±0.68	4.14 ±1.72	5.97 ±1.19
2 weeks after surgery at quadrant 2	3.75 ±0.93	2.62 ±0.93	3.99±0.90	5.67±0.46
2 weeks after surgery at quadrant 3	3.35±0.83	2.34 ±0.31	3.40 ±0.88	5.55 ±1.62
8 weeks after surgery at quadrant 4	3.05 ±0.34	2.52±0.35	3.31±0.64	4.66 ±0.87
P value	<0.001	<0.001	<0.001	<0.001

P<0.05 was considered statistically significant.

**BOP**

BOP decreased from 88.65% ± 25.25% at baseline to 8.97% ± 10.67% at the end of the study. There was a marked difference between the BOP scores of visits one, two, and three and those of visits four and five. Also, a remarkable difference was observed between the BOP scores of visit six and those of the other visits (Table 3).

Table 3. Mean±standard deviation of BOPs at several visits

Visit	BOP (%)
1 (baseline)	88.65 ± 25.25
2 (8 weeks post-SRP)	71.00 ± 27.05
3 (2 weeks after surgery at quadrant 1)	60.45 ± 27.08
4 (2 weeks after surgery at quadrant 2)	50.05 ± 14.13
5 (2 weeks after surgery at quadrant 3)	33.17 ± 11.03
6 (8 weeks after surgery at quadrant 4)	8.97 ± 10.67
P value	<0.001

P<0.05 was considered statistically significant.

**Discussion:**

Our data support the notion that periodontitis at untreated sites may undergo some improvement in parallel with the surgical treatment of adjacent sites. This may have significant implications when proposing a treatment plan following the initial phase of treatment (1, 12 and 25), traditionally, treatment planning is based on the reassessment data gathered 6 to 8 weeks following the initial phase of therapy. Once the decision is made, it is not subjected to revision because it is considered a definitive treatment plan at that stage. It is assumed that the pockets will not undergo significant change after the reassessment. Our data demonstrated that the pockets in the untreated quadrants might benefit from the surgical treatment performed at the adjacent sites, and this benefit proved to be statistically significant (23, 24). In one patient, the improvement was such that his last quadrant surgery was cancelled, and there was no need for periodontal surgery; thus, his data were not included in the analyses. Inclusion of those data would have improved the findings. Furthermore, we did not perform regenerative techniques in our study because of the limited resources (25). Perhaps if we had done so, improvement of the periodontal parameters of the untreated quadrants would have been even more significant. One may argue that the improvement observed at the untreated quadrant could be attributed to the fact that systemic antibiotics are often prescribed for patients during the surgical phase (26). Moreover, antibacterial mouthwashes, such as chlorhexidine, are given to the patients as an adjunct to treatment. Such treatments may influence the outcome as a result of their effect on the pathogenic microbiota of the yet untreated sites, producing some reduction in the inflammation and pocketing at these sites (28). However, neither antibiotics nor antibacterial mouthwashes were prescribed following the treatment sessions. Therefore, the pre surgical improvement observed at the last quadrant could not be attributed to the use of antibiotics or mouthwashes (2, 8, 12 and 26). However, the so-called Hawthorne effect, (2, 25) i.e., the improvement in the patients' home care performance once they enter the study, is a recognized phenomenon and could have affected the results, although we tried to minimize this effect by ensuring that the patients kept a very high standard of oral hygiene prior to entering the study. Not having a control group in our study, one could speculate that improvements observed in this experiment might be the continuation of the benefit produced by SRP. We believe that we needed a control group to be able to draw a definitive conclusion as to what factor(s) contributed to the observed phenomenon (8, 25, 27 and 29). However, according to the results of several studies documenting that the main improvement following SRP is found during the first 2 to 3 months following therapy, the observed improvement in our study is beyond the expected effect of SRP. Some long-term studies also demonstrated that little improvement was observed after month 3. When a considerable improvement was reported at 6 or 9 months following the start of SRP, it happened when maintenance SRP was performed at 3, 6, or 9 months. Many other studies [12, 13, 16, 25], documented that the changes that occurred after the first 8 weeks of SRP were small compared to the changes observed during the first 8 weeks; because of this fact, the reassessment is usually performed 6 to 8 weeks following SRP. Our data indicated that a statistically and clinically significant change in PPD occurred in quadrant four after the start of the surgical phase in adjacent quadrants but before surgery in that quadrant. This amounted to significant values of 1.8 and 2.1 mm for pockets between 5 and 7 mm and >7 mm, respectively. We speculate that the main reasons for the improvements observed during the surgical treatments of the other quadrants are the overall elimination of the bacterial load, removal of the granulation tissue, and perhaps the inoculation effect caused by the mechanical manipulation of periodontal tissues in the presence of pathogenic bacteria. Reduction in the bacterial load, apart from its obvious benefits, may also have played a role by increasing the antibody avidity. As described by Wang, (20). Antibody avidity is increased immediately following treatment. Antibody titers against periodontopathic bacteria are higher among periodontitis subjects than healthy controls. Reports on whether antibody titers are increased or decreased after therapy are contradictory. Although some investigators found an increase in antibody titers against periodontopathic bacteria, others reported a decrease as a result of treatment (20, 22). However, even after successful treatment, antibody titers remained higher in periodontitis patients than in healthy controls (29). These reports collectively indicate that antibodies have a protective role in halting the progression of periodontal destruction. It is possible that the avidity of serum antibodies against periodontal pathogens was increased after surgical treatment performed at adjacent quadrants. This may be a result of a reduction in the bacterial load. Alternatively, it may be an inoculation effect due to manipulation of tissues or immune maturation. The overall effect could be that the host is confronted with fewer pathogenic bacteria and benefits from a more forceful humeral defense. We did not measure the antibody titers and avidity during our study, and we believe this to be one of its shortcomings. Further investigations with simultaneous monitoring of humeral response and clinical changes at untreated sites could give greater insight into this matter. Also, additional studies using control groups are warranted.

## CONCLUSION

Although a remarkable change occurred prior to the surgical treatment of the last quadrant, a further significant change took place between sessions five and six, indicating that the surgery could benefit the patient if there are remaining pockets and BOP. Anatomic restrictions, such as enamel projections, grooves, and furcation lesions, often require surgical flap reflection to completely remove bacterial plaque and calculus. Therefore, our findings should not be interpreted to mean that surgical treatment of other quadrants may completely eliminate the need for quadrant-four surgery. Given the limitations of this preliminary study and the lack of adequate controls, we believe that the results should be interpreted with caution.

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