

Short-term effects of initial, nonsurgical periodontal treatment (hygienic phase)

E. C. MORRISON, S. P. RAMFJORD AND R. W. HILL

The University of Michigan, School of Dentistry, Department of Periodontics and Dental Research Institute, Ann Arbor, Michigan, U.S.A.

Abstract. Longitudinal studies have reported the effect of various modalities of periodontal surgery on pocket depth and attachment levels related to pretreatment measurements. However, possible changes in these measurements as a result of scaling, oral hygiene improvements and occlusal adjustment during the hygienic phase were not considered. The purpose of the present study was to examine the short-term effect of treatment of the hygienic phase in 90 patients with some pockets extending 4 mm or more apically to the CEJ. Pretreatment pocket depths and attachment levels related to the CEJ were measured by a thin probe in five sites at all 2,355 teeth in the sample. Scaling, root planing, instruction in oral hygiene and occlusal adjustment were completed during four to six sessions for each patient.

Four weeks after completion of the hygienic phase, all variables were recorded. Mean measurements for pocket depths 1-3 mm, 4-6 mm, and ≥ 7 mm prior to treatment were compared to their posttreatment scores. Pocket depth decreased significantly for pockets extending 4 mm or more apically to the FGM. For pockets 4-6 mm there was a mean difference in pocket depth of 0.96 ± 0.47 mm ($P < .0001$) between pretreatment and posttreatment observations. For pockets 7 mm or greater the mean difference was 2.22 ± 1.35 mm ($P < .0001$). Reduction in depth of pocket and improvement in attachment levels were related to the initial level of severity. Pocket reduction was in part due to the improvement in attachment levels. This study has demonstrated that the clinical severity of periodontitis is reduced significantly 1 month following the hygienic phase of periodontal therapy, and that need for surgical pocket treatment cannot be assessed properly until completion of the hygienic phase of treatment.

Periodontal treatment often is divided into a presurgical or hygienic phase and a surgical or corrective phase (Ramfjord & Ash 1979). A number of clinical trials have tested results of various methods of periodontal surgical therapy (Lindhe & Nyman 1975,

Nyman et al. 1975, Ramfjord et al. 1968, 1973, 1975, Rosling et al. 1976, Sandmeier et al. 1973, Waite 1976, Zamet 1975). However, the specific effect of presurgical scaling and root planing, improvement in oral hygiene, and occlusal adjustment on the

severity of periodontitis has not been singled out in these longitudinal studies, although a limited number of studies have provided indirect evidence (Tagge et al. 1975, Waite 1976, Zamet 1975) of the beneficial changes which may occur following presurgical scaling and improvement in oral hygiene. Furthermore, most reports of results following periodontal treatment have not considered the influence of the distribution and severity of the lesions on pre- and postsurgical results. The significance of patterns of morbidity becomes of paramount importance when attempting to demonstrate the effect of various types of treatment (Knowles et al. 1979).

Partial scoring of the mouth or measurements of selected teeth or surfaces (Sandmeier et al. 1973, Tagge et al. 1975, Waite 1976) have been employed to measure the effect of treatments, although complete sampling of all teeth and surfaces would appear to be indicated in clinical trials of periodontal treatments, since the process of drawing inferences about a population from a sample would otherwise be limited to selected teeth or anatomic sites. This lack of complete sampling has hampered interstudy comparisons.

The elimination or reduction of local etiologic factors, traditionally, is the major objective in the initial periodontal therapy. Thus, scaling, root planing, elimination of occlusal interferences, and the introduction of oral hygiene methods have been considered primary procedures of the hygienic or presurgical phase of periodontal treatment.

At the conclusion of the hygienic phase, the therapist has the opportunity to evaluate the patient's tissue response and oral hygienic effectiveness. The periodontal status at this time is compared to the pretreatment findings, and decisions are made regarding the need for surgical treatment.

The purpose of the present study was to

examine in a human population the short-term effect of hygienic phase related treatment in patients with a diagnosis of moderate to severe periodontal disease and anticipated need for subsequent surgical therapy.

Material and Methods

Ninety subjects 24 to 68 years old (mean age 45 years) were selected for a longitudinal study of the effects of periodontal treatment in moderate and advanced periodontal lesions. The subjects were selected from persons seeking dental care at The University of Michigan School of Dentistry, including persons referred to the school for periodontal treatment. All subjects had some periodontal pockets extending 4.0 mm or more apically to the cemento-enamel junction and at least 20 treatable teeth. Patients with removable dental appliances were not included in the study. All patients were considered to be in good general health. The sample included 53 females and 37 males.

A brief discussion of objectives of periodontal treatment and criteria for participation in the longitudinal study were provided to all subjects and patient consent was obtained. The study was conducted within the facilities for clinical research of the Dental Research Institute of The University of Michigan. Prior to the scoring, medical and dental histories were obtained in conjunction with oral examination, and a complete series of periapical radiographs, dental and periodontal charts, photographs, and diagnostic casts.

The extent of dental plaque accumulation was classified according to the Kobayashi & Ash Index (1964) for facial and lingual areas around the tooth.

Dental calculus was assessed according to the criteria of the Periodontal Disease Index (Ramfjord 1959, 1967).

Qualitative changes in the gingiva were

Table 1. Change in dental plaque on the buccal aspect of teeth in 90 subjects 1 month following hygienic phase

Veränderung des dentalen Plaquestatus an den bukkalen Flächen der Zähne von 90 Probanden, einen Monat nach der Hygienephase

Changements concernant la plaque dentaire du côté vestibulaire des dents chez 90 sujets un mois après la phase hygiénique

Category	N	Diff.<0	Diff.>0	Diff.=0	T ⁺	T ⁻	P
0*	90	48	4	38			
1	90	60	13	17		2323.5	< .0001
2	90	53	28	9		2241.0	< .0063
3	90	9	77	4	3490.0		< .0001
4*	90	4	46	40			
5*	90	2	23	65			

* Wilcoxon test not applicable

Category (*Beurteilungseinheit, catégorie*).

classified according to the PDI. Facial and lingual aspects of all teeth were scored separately.

The severity of periodontitis was assessed by criteria for depth of pocket and level of attachment of the Periodontal Disease Index. The Marquis M-1 periodontal probe graduated at 3, 6, 8 and 11 mm and with a tip diameter of 0.4 mm was used to measure depth of pocket and the levels of attachment. The periodontal probe was held with a light grasp and pointed toward the apex of the tooth. Measurements were

rounded to the nearest millimeter; however, any observation close to 0.5 mm was rounded to the lower whole number.

The distance from the free gingival margin to the cemento-enamel junction, and the distance from the free gingival margin to the bottom of the gingival crevice or pocket was measured at five aspects of each tooth examined. The distobuccal, buccal, mesiobuccal, lingual and mesiolingual aspects of all teeth were scored in the maxilla and mandible. The buccal measurement for molars was made at the most buccal aspect

Table 2. Change in dental plaque on the lingual aspect of teeth in 90 subjects 1 month following hygienic phase

Veränderung des dentalen Plaquestatus an den lingualen Flächen der Zähne von 90 Probanden, einen Monat nach der Hygienephase

Changements concernant la plaque dentaire du côté lingual des dents chez 90 sujets un mois après la phase hygiénique

Category	N	Diff.<0	Diff.>0	Diff.=0	T ⁺	T ⁻	P
0*	90	22	0	68			
1	90	41	5	44		985.0	< .0001
2	90	65	15	10		2773.0	< .0001
3	90	25	57	8	2675.5		< .0001
4	90	14	59	17	2278.0		< .0001
5*	90	4	35	51			

* Wilcoxon test not applicable

of the mesial root. The lingual measurement for mandibular molars was made at the most lingual aspect of the mesial root, while the interproximal measurements were made as close to the contact areas as possible and with the probe parallel to the long axis of the teeth.

Measurements were taken from all teeth present. Only fully erupted teeth were scored, and other teeth were not substituted for missing teeth. Teeth indicated for extraction at the initial oral examination were not included in the study, thus reducing the possibility of selecting a biased sample. The four indices were recorded in the following order: (1) gingival index, (2) calculus index, (3) pocket depth and loss of attachment and (4) plaque index.

Following scoring for baseline data, the subjects were treated by hygienists under supervision of staff periodontists. The treatment included scaling, root planing, and instruction in oral hygiene. Approximately four to six appointments over a period of a month (a total of 5 to 8 h) were required to complete the hygienic phase for each subject. A periodontist checked the completeness of dental calculus removal. Occlusal adjustment and placement of emergency restorations when indicated, were performed by a periodontist. All initial measurements and scorings were repeated for each subject 4 weeks following the completion of scaling, root planing and occlusal adjustment (the hygienic phase). The examiner who did the initial scoring also did the rescoring.

Statistical analysis

The Wilcoxon signed rank test (Hollander & Wolfe 1973) was used for statistical analyses of the categorical variables of dental plaque, calculus and gingivitis. The pair of measurements for each subject represented the proportion of teeth in each index category before and after treatment. The statistical tests the null hypothesis that the distri-

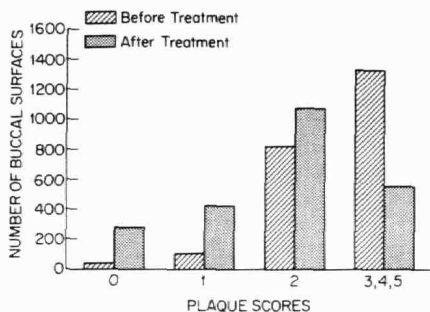


Fig. 1. Frequency distribution of plaque scores on buccal surfaces of 2,355 teeth in 90 subjects before and after hygienic phase: 0 = absence of plaque; 1 = plaque-one interproximal surface, $< \frac{1}{3}$ of gingival half of tooth; 2 = plaque - two interproximal surfaces, $< \frac{1}{3}$ of gingival half of tooth; 3 = plaque-mesial to distal, $< \frac{1}{3}$ of gingival half of tooth; 4 = plaque - $\frac{1}{3}$ - $\frac{2}{3}$ of gingival half of tooth; 5 = plaque-gingival half of tooth.

Die Vorkommenshäufigkeit der Beurteilungseinheiten (scores) für Plaque an den bukkalen Oberflächen von 2,355 Zähnen von 90 Probanden vor und nach der Hygienephase: 0 = keine Plaque; 1 = Plaque an einer approximalen Fläche, $< \frac{1}{3}$ der gingivalen Hälfte des Zahnes; 2 = Plaque an zwei approximalen Flächen, $< \frac{1}{3}$ der gingivalen Zahnhälfte; 3 = Plaquematerial von mesial nach distal, $< \frac{1}{3}$ der gingivalen Zahnhälfte; 4 = Plaque an $\frac{1}{3}$ - $\frac{2}{3}$ der gingivalen Zahnhälfte; 5 = Plaque an der gingivalen Hälfte des Zahnes.

Distribution de fréquence des scores de la plaque sur les faces vestibulaires de 2355 dents chez 90 sujets avant et après la phase hygiénique: 0 = absence de plaque; 1 = plaque sur une face interproximale sur $< \frac{1}{3}$ de la moitié gingivale de la dent; 2 = plaque sur deux faces interproximales sur $< \frac{1}{3}$ de la moitié gingivale de la dent; 3 = plaque de mésial à distal sur $< \frac{1}{3}$ de la moitié gingivale de la dent; 4 = plaque sur $\frac{1}{3}$ - $\frac{2}{3}$ de la moitié gingivale de la dent; 5 = plaque sur la moitié gingivale de la dent.

bution of the differences between two proportions in a particular category is symmetric about zero. The null hypothesis was rejected at the 0.05 level of significance.

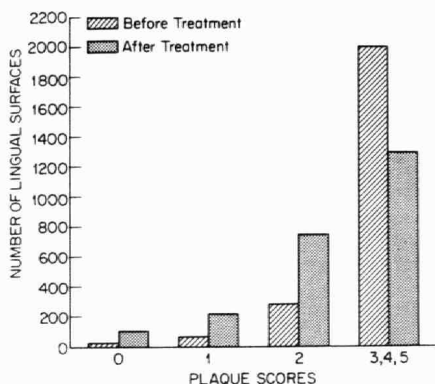


Fig. 2. Frequency distribution of plaque scores on lingual surfaces of 2,355 teeth in 90 subjects before and after hygienic phase: 0 = absence of plaque; 1 = plaque-one interproximal surface, $< \frac{1}{3}$ of gingival half of tooth; 2 = plaque-two interproximal surfaces, $< \frac{1}{3}$ of gingival half of tooth; 3 = plaque-mesial to distal, $< \frac{1}{3}$ of gingival half of tooth; 4 = plaque - $\frac{1}{3}$ - $\frac{2}{3}$ of gingival half of tooth; 5 = plaque-gingival half of tooth.

Vorkommenshäufigkeit der Beurteilungseinheiten (scores) für Plaque an den lingualen Oberflächen von 2,355 Zähnen bei 90 Probanden vor und nach der Hygienephase: 0 = keine Plaque; 1 = Plaque an einer approximalen Fläche, $< \frac{1}{3}$ der gingivalen Hälfte des Zahnes; 2 = Plaque an zwei approximalen Flächen, $< \frac{1}{3}$ der gingivalen Zahnhälfte; 3 = Plaquematerial von mesial nach distal, $< \frac{1}{3}$ der gingivalen Hälfte des Zahnes; 4 = Plaque an $\frac{1}{3}$ - $\frac{2}{3}$ der gingivalen Zahnhälfte; 5 = Plaque an der gingivalen Hälfte des Zahnes.

Distribution de fréquence des scores de la plaque sur les faces linguales de 2355 dents chez 90 sujets avant et après la phase hygiénique: 0 = absence de plaque, 1 = plaque sur une face interproximale sur $< \frac{1}{3}$ de la moitié gingivale de la dent; 2 = plaque sur deux faces interproximales sur $< \frac{1}{3}$ de la moitié gingivale de la dent; 3 = plaque de mésial à distal sur $< \frac{1}{3}$ de la moitié gingivale de la dent; 4 = plaque sur $\frac{1}{3}$ - $\frac{2}{3}$ de la moitié gingivale de la dent; 5 = plaque sur la moitié gingivale de la dent.

Reduction in depth of pocket and gain in level of attachment were analyzed by Stu-

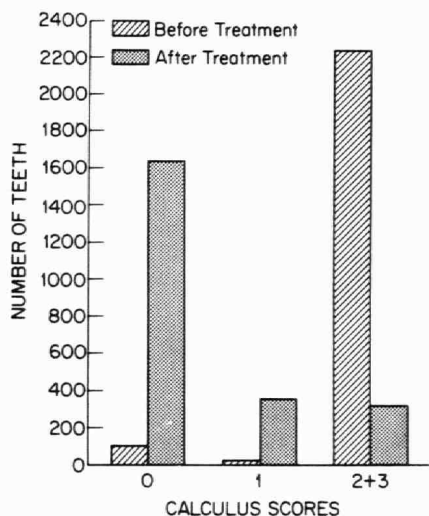


Fig. 3. Frequency distribution of calculus scores for 2,355 teeth in 90 subjects before and after hygienic phase: 0 = absence of calculus; 1 = supragingival calculus; 2 = moderate supra- and subgingival calculus; 3 = abundant supra- and subgingival calculus.

Die Vorkommenshäufigkeit von Beurteilungseinheiten (scores) für Zahnstein an 2,355 Zähnen bei 90 Probanden vor und nach der Hygienephase: 0 = kein Zahnstein; 1 = supragingivaler Zahnstein; 2 = mässiges Vorkommen von supra- und subgingivalem Zahnstein; 3 = reichlicher supra- und subgingivaler Zahnstein.

Distribution de fréquence des scores du tartre sur 2355 dents chez 90 sujets avant et après la phase hygiénique: 0 = absence de tartre; 1 = tartre sus-gingival; 2 = quantité modérée de tartre sus et sous-gingival; 3 = quantité abondante de tartre sus et sous-gingival.

dent's paired method (Li 1964). The difference between mean measurements within each subject before and after presurgical treatments was the variable analyzed.

Results

Significant reductions in dental plaque which covered one-third to one-half of the

Table 3. Change in dental calculus in 90 subjects 1 month following hygienic phase
Veränderung der Zahnsteinablagerungen bei 90 Probanden, einen Monat nach der Hygienephase
Changements concernant le tartre dentaire chez 90 patients un mois après la phase hygiénique

Category	N	Diff.<0	Diff.>0	Diff.=0	T ⁺	T ⁻	P
0	90	87	0	3		3828.0	< .0001
1	90	72	3	15		2778.0	< .0001
2	90	0	87	3	3828.0		< .0001
3*	90	0	4	86			

* Wilcoxon test not applicable

buccal and lingual surfaces of the clinical crown (categories 3, 4, 5) are shown in Tables 1 and 2. There was a significant increase in the proportion of buccal and lingual surfaces with dental plaque on two interproximal surfaces or any two gingival margins (category 2) (see Tables 1 and 2). A significant increase in the proportion of buccal and lingual surfaces with dental plaque on one interproximal surface or aspect of the gingival margin (category 1 - low plaque) is also shown in Tables 1 and 2 which indicated a significant shift in the distribution of frequencies of categories of plaque. Differences in dental plaque for buccal and lingual surfaces in categories 0, 4 and 5 were not tested statistically. The Wilcoxon test was inappropriate in these

categories due to the large number of zero differences.

There was a greater number of lingual surfaces (1300) with plaque scores in category 3 than buccal surfaces (567) following the hygienic phase (Figs. 1 and 2).

A significant decrease in the proportion of teeth with subgingival calculus (category 2) following presurgical treatment is shown in Table 3, Fig. 3. A significant increase in the proportion of teeth without calculus deposits (category 0) was observed following scaling and root planing (Table 3, Fig. 3).

A significant decrease in severe gingivitis extending from mesial to distal (category 2) at both buccal and lingual sites is shown in Tables 4 and 5. The proportions of buccal and lingual sites with mild to moderate in-

Table 4. Change in buccal inflammation of the gingiva in 90 subjects 1 month following hygienic phase

Veränderung der Entzündung der bukkalen Region der Gingiva bei 90 Probanden, einen Monat nach der Hygienephase
Changements concernant l'inflammation gingivale du côté vestibulaire chez 90 sujets un mois après la phase hygiénique

Category	N	Diff.<0	Diff.>0	Diff.=0	T ⁺	T ⁻	P
0	90	79	3	8		3382.0	< .0001
1	90	49	33	8		2139.5	< .0429
2	90	0	85	5	3655.0		< .0001
3*	90	0	5	85			

* Wilcoxon test not applicable

Table 5. Change in lingual inflammation of the gingiva in 90 subjects 1 month following hygienic phase

Veränderung der Entzündung der lingualen Region der Gingiva bei 90 Probanden, einen Monat nach der Hygienephase

Changements concernant l'inflammation gingivale du côté lingual chez 90 sujets un mois après la phase hygiénique

Category	N	Diff.<0	Diff.>0	Diff.=0	T ⁺	T ⁻	P
0	90	77	0	13		3.003.0	< .0001
1	90	72	13	5		3.250.0	< .0001
2	90	1	86	3	3827.0		< .0001
3*	90	0	5	85			

* Wilcoxon test not applicable

inflammatory gingival changes not extending from mesial to distal (category 1) increased significantly (Tables 4 and 5).

A significant increase in the proportion of buccal and lingual sites without signs of inflammation (category 0) was also observed (Figs. 4 and 5).

Measurements for depth of pocket and level of attachment were classified into three categories of severity on the basis of pocket depth. Mean measurements for depth of pockets: 1-3 mm, 4-6 mm, and \geq

7 mm prior to treatment were compared with their posttreatment scores by paired t-statistics. Individual scores were classified into three levels of severity because it was felt that the initial severity of a lesion could interfere with the effect of presurgical treatment. The difference between mean measurements within a subject before and after presurgical treatment was the variable analyzed.

There was a significant decrease in depth of pocket as scored by the probe for all

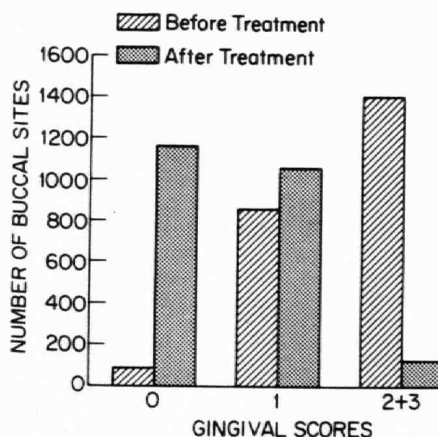


Fig. 4. Frequency distribution of gingival scores in buccal sites of 2,355 teeth in 90 sub-

jects before and after hygienic phase: 0 = absence of inflammation; 1 = mild to moderate inflammation not extending from mesial to distal; 2 = mild to moderate inflammation extending from mesial to distal; 3 = severe gingivitis.

Die Vorkommenshäufigkeit von gingivalen Beurteilungseinheiten (scores) an bukkalen Regionen von 2,355 Zähnen bei 90 Probanden vor und nach der Hygienephase: 0 = keine Entzündung; 1 = milde bis mässige Entzündung, die sich noch nicht von mesial bis distal hin ausgebreitet hat; 2 = milde bis mässige Entzündung, die sich bereits von mesial nach distal hin ausgebreitet hat; 3 = schwere Gingivitis.

Distribution de fréquence des scores gingivaux au niveau des sites vestibulaires de 2355 dents chez 90 sujets avant et après la phase hygiénique: 0 = absence d'inflammation; 1 = inflammation légère à modérée n'allant pas de mésial à distal; 2 = inflammation légère à modérée allant de mésial à distal; 3 = gingivite grave.

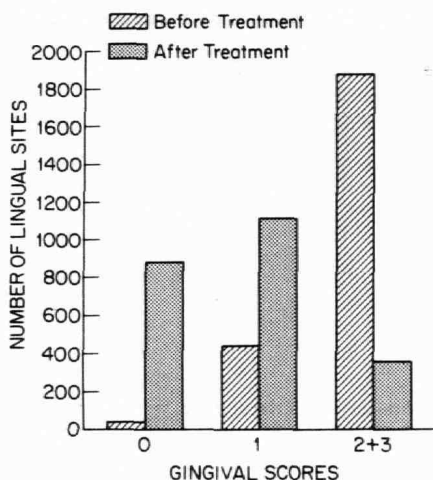


Fig. 5. Frequency distribution of gingival scores in lingual sites of 2,355 teeth in 90 sub-

jects before and after hygienic phase: 0 = absence of inflammation; 1 = mild to moderate inflammation not extending from mesial to distal; 2 = mild to moderate inflammation extending from mesial to distal; 3 = severe gingivitis.

three levels of severity. The mean depth of pocket was 2.30 mm (Table 6) before treatment for sulci 1-3 mm. In pockets 4-6 mm the mean depth prior to treatment was 4.56 mm. The mean depth at baseline was 7.57 mm for pockets 7 mm or greater. The reduction in depth of pocket was least for crevices 1-3 mm before treatment. There was a mean reduction in depth of pocket of

0.17 \pm 0.23 mm in these sites. For pockets 4-6 mm there was a mean difference in pocket depth of 0.96 \pm 0.47 mm between pretreatment and posttreatment observations. For pockets 7 mm or greater the mean difference was 2.22 \pm 1.35 mm. The reduction in depth of pocket was related to the severity of depth of pocket at the initial examination (Fig. 6).

Die Vorkommenshäufigkeit von gingivalen Beurteilungseinheiten (scores) an lingualen Regionen von 2,355 Zähnen bei 90 Probanden vor und nach der Hygienephase: 0 = keine Entzündung; 1 = milde bis mässige Entzündung, die sich noch nicht von mesial bis nach distal hin ausgebreitet hat; 2 = milde bis mässige Entzündung, die sich bereits von mesial nach distal hin ausgebreitet hat; 3 = schwere Gingivitis.

Distribution de fréquence des scores gingivaux au niveau des sites linguaux de 2355 dents chez 90 sujets avant et après la phase hygiénique: 0 = absence d'inflammation; 1 = inflammation légère à modérée n'allant pas de mésial à distal; 2 = inflammation légère à modérée allant de mésial à distal; 3 = gingivite grave.

Table 6. Change in depth of pocket in millimeters (mm) in 90 subjects 1 month following the hygienic phase of periodontal therapy

Veränderung der Zahnfleischtaschentiefen in Millimetern (mm) bei 90 Probanden, einen Monat nach der Hygienephase der Parodontaltherapie

Changements concernant la profondeur des culs-de-sac en mm (mm) chez 90 sujets un mois après la phase hygiénique du traitement parodontal

Pocket depth	N	Before treatment	After treatment	Mean difference	s.d.	t	P
1-3 mm	90	2.30	2.13	0.17	0.23	7.10	< .0001
4-6 mm	90	4.56	3.60	0.96	0.47	19.28	< .0001
≥ 7 mm	55	7.57	5.35	2.22	1.35	12.15	< .0001

Pocket depth (*Taschentiefe, profondeur des culs-de-sac*), before treatment (*vor der Behandlung, avant traitement*), after treatment (*nach der Behandlung, après traitement*), mean difference (*mittlerer Unterschied, différence moyenne*).

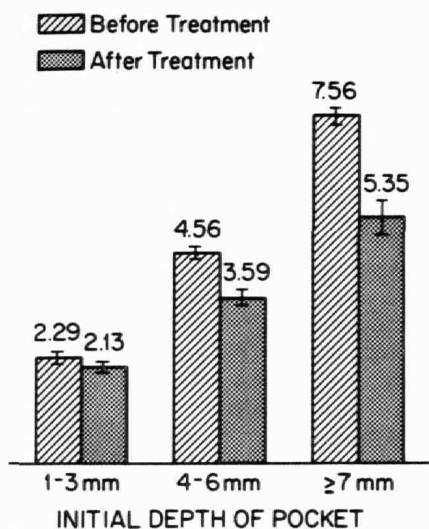


Fig. 6. Mean depth of pockets in mm in 90 subjects before and after hygienic phase.

Mittlere Taschentiefe in mm. bei 90 Probanden vor und nach der Hygienephase.

Profondeur moyenne des culs-de-sac en mm chez 90 sujets avant et après la phase hygiénique.

The attachment level as scored by the probe had improved significantly (Table 7). Mean differences in the change in the level of attachment were related to the severity

of depth of pocket at baseline. The greatest increase in level of attachment was observed in sites with depth of pocket 7 mm or greater before treatment. The increase in attachment level in these sites was 0.91 ± 0.95 mm. In pockets 4-6 mm a mean gain of 0.23 ± 0.38 mm was noted. The clinical effect was nonsignificant in sites with only minimal loss of periodontal support before presurgical treatment (Fig. 7).

Discussion

These results demonstrate that the removal of bacterial plaque and calculus were followed by a reduction in the severity of inflammation 4 weeks after hygienic phase or presurgical treatment. The significant shift in the distribution of frequencies to low plaque categories on both buccal and lingual surfaces differs from final values of the Plaque Index in studies by Waite (1976) and Zamet (1975), who following hygienic phase reported mean values of 0.55 ± 0.03 and 0.57 ± 0.07 , respectively. The mean values represented all scores within a segment. Analyses of ordinal data in these studies failed to disclose significant changes in the distribution of dental plaque on mesial, buccal, distal, or lingual surfaces.

Change in the effectiveness of oral hy-

Table 7. Change in level of attachment in millimeters (mm) in 90 subjects 1 month following the hygienic phase of periodontal therapy

Veränderung des Attachementniveaus in Millimetern (mm) bei 90 Probanden, einen Monat nach der Hygienephase der Parodontaltherapie

Changements concernant le niveau de l'attachement en mm (mm) chez 90 sujets un mois après la phase hygiénique du traitement parodontal

Initial pocket depth	N	Before treatment	After treatment	Mean difference	s.d.	t	P
1-3 mm	90	1.81	1.86	-0.04	0.28	1.46	< .1478
4-6 mm	90	2.88	2.66	0.23	0.38	5.68	< .0001
≥7 mm	55	5.57	4.66	0.91	0.95	7.12	< .0001

Initial pocket depth (ursprüngliche Taschentiefe, profondeur initiale des culs-de-sac).

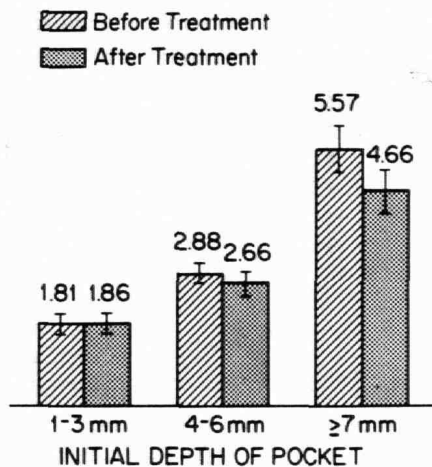


Fig. 7. Mean loss of attachment in mm in 90 subjects before and after hygienic phase.

Mittlerer Attachmentverlust in mm. bei 90 Probanden vor und nach der Hygieneperiode.

Perte d'attachement moyenne en mm chez 90 sujets avant et après la phase hygiénique.

giene measures in the present study was measured by rating stained plaque on each tooth surface. The score measured the extent of dental plaque on the gingival half of the tooth. A significant increase in the proportion of buccal and lingual sites with dental plaque on two interproximal surfaces or any two gingival margins suggests that the satisfactory management of interproximal surfaces on a daily basis by subjects had not been achieved 4 weeks after the conclusion of the hygienic phase. Oral hygiene was most effective on the buccal surfaces both before and after hygienic phase.

The significant change in the severity of dental plaque could not be correlated with gain in attachment level and reduction in depth of pocket in this study. Changes in stained plaque may not fully reflect changes in the pathogenicity of plaques following hygienic phase. In the future, investigations of the presurgical phase should include bac-

teriologic studies of the quantitative and qualitative changes in the commensal microflora of periodontal pockets.

The results must also be related to the removal of dental calculus and the planing of surfaces of roots. Findings in the present study are in agreement with the mean gain of attachment and reduction in depth of pocket reported by Tagge et al. (1975) 8 weeks following root planing and oral hygiene, and should be compared to results in pockets treated with oral hygiene only. In pockets which were not treated with root planing in the study by Tagge et al. (1975), there was no significant change in attachment level, and less pocket reduction than in those pockets treated with root planing and oral hygiene.

The significant decrease in subgingival calculus following scaling and the preparation of the surfaces of roots has not been documented before in a clinical trial. It should be noted that the careful removal of dental calculus and instruction in oral hygiene for each subject required four to six appointments over a period of a month. Each appointment was approximately 1½ h in length. The presence of supragingival calculus on selected teeth after the hygienic phase would indicate that personal oral hygiene was not effective in those sites.

The significant reduction in gingival inflammation 4 weeks following the hygienic phase agrees with the results of Tagge et al. (1975). Four months after the initial preparation, Zamet (1975) found a nonsignificant increase in gingival inflammation which paralleled a significant increase in dental plaque. The mean GI value of 1.4 six weeks following presurgical treatment (Waite 1976) was greater than the mean GI of 0.90 observed by Zamet (1975) 4 months after initial preparation of the mouth.

The results of this investigation suggest that the significant resolution of gingival inflammation was a function of three factors

during the hygienic phase: (1) scaling and root planing, (2) effectiveness of personal oral hygiene measures following the completion of scaling and root planing, and (3) the length of the interval between the completion of procedures and the assessment of gingival response. In the present study, an evaluation of gingival inflammation was made 4 weeks after completion of scaling and root planing procedures. It is unclear in the study by Waite (1976) if presurgical treatment included root planing procedures. The recurrence of gingival inflammation (Zamet 1975) may have reflected the tissue reaction to returning bacterial plaque.

The majority of reports of the results of periodontal treatment have not evaluated the influence of the distribution and severity of lesions on posttreatment results. Of the 11,775 sites which were probed at the initial examination in the present study, 3,566 sites were identified as having a pocket depth equal to or greater than 4.0 mm. The distribution of loss of attachment in mesiobuccal sites in the present study is in agreement with the distribution of original loss for 729 teeth reported by Ramfjord et al. (1968). The small differences in gain in attachment and reduction in depth of pocket recorded after the hygienic phase by Waite (1976) and Zamet (1975) may have resulted from analyses based solely on mean measurements of all surfaces in a quadrant which may have included a large number of 1-3 mm crevices without any change. Thus, results in the present investigation show clearly that the distribution of the severity of loss of attachment and depth of pockets within patients may obscure the effect of treatment if lesions are not classified according to the initial level of severity.

Mean differences in the improvement in the level of attachment and reduction in depth of pocket were related to categories of severity at baseline. In 90 subjects the mean change in level of attachment of

-0.04 ± 0.28 mm. ($P < .1478$), for crevices 1-3 mm and the mean reduction in depth of pocket of 0.17 ± 0.23 mm ($P < 0.001$) apparently were not of clinical importance. In periodontal pockets 4-6 mm and ≥ 7 mm, the gain in level of attachment (0.23 ± 0.38 mm and 0.91 ± 0.95 mm) and reduction in depth of pocket (0.96 ± 0.47 mm and 2.22 ± 1.35 mm) were both statistically ($P < .0001$) and clinically important.

Changes in level of attachment and reduction in depth of pocket occurred without the deliberate removal of the epithelial lining of the pocket. The extent of possible reattachment of epithelial and connective tissues cannot be assessed clinically by probing. The results must be related to one or more of the following aspects which may have facilitated the extent of healing and shrinkage of inflamed tissue: (1) removal of plaque and calculus, (2) planing of surfaces of roots, (3) morphology and depth of lesion, and (4) effect of occlusal adjustment.

The design of the study has provided appropriate and precise information with great statistical efficiency. The paired-sample design reduced the effect of experimental error on treatment differences when each subject serves as his own control. Stratification on the basis of initial severity has also increased the sensitivity of the design. The paired-sample approach has not been fully utilized in longitudinal studies of periodontal therapy (Ramfjord et al. 1975, Zamet 1975) with the exception of studies by Tagge et al. (1975) and Waite (1976).

The effect of presurgical treatment on surgical results has not been considered in most longitudinal studies of periodontal therapy (Lindhe et al. 1975, Nyman et al. 1975, Ramfjord et al. 1975, Rosling et al. 1976, Sandmeier et al. 1975, Waite 1975, Zamet 1975). An influence of the initial severity on total treatment results was noted by Ramfjord et al. (1968) and Knowles et al. (1979). Teeth with pockets deeper than 3

mm had a more favorable response than teeth with crevices 1-3 mm. Findings in the present study suggest that the significant gain in level of attachment and reduction in depth of pocket in the hygienic phase are factors which may influence the effects which have been reported for surgical treatments.

Conclusions

This study has demonstrated that the clinical severity of periodontitis is reduced significantly 1 month following the hygienic phase of periodontal therapy, and that need for surgical pocket treatment cannot be assessed properly until completion of the hygienic phase of treatment.

Zusammenfassung

Kurzzeiteffekte einleitender, nichtchirurgischer Parodontalbehandlung

Langzeitstudien haben den Effekt parodontal-chirurgischer Therapie auf die Taschentiefe und das Attachmentniveau beschrieben. Die Ergebnisse solcher Studien werden in Bezug auf Messungen beurteilt, die vor dem Behandlungsbeginn vorgenommen worden sind. Änderungen von Messresultaten als Folge von Zahnsteinentfernung, der Verbesserung oraler Hygiene und durch okklusale Belastungsausgleich sind jedoch kaum berücksichtigt worden. In der vorliegenden Studie wird bei 90 Patienten (Taschentiefen von über 4 mm oder mit apikal der Schmelzzementgrenze befindlichem Taschenboden), der Kurzzeiteffekt der während der Hygienephase vorgenommenen Behandlung untersucht. Bei 2,355 Zähnen wurde an 5 Stellen die Taschentiefe und die Attachmentniveaus, mit Ausgangspunkt von der Schmelzzementgrenze, mit einer feinen Sonde gemessen. Zahnsteinentfernung, Wurzelglättung, Unterweisung in oraler Hygiene und okklusaler Belastungsausgleich wurden bei jedem Patienten in durchschnittlich vier bis sechs Sitzungen vorgenommen.

Vier Wochen nach der abgeschlossenen Hygienephase wurden alle Variablen registriert. Vor der Behandlung gemessene Taschentiefen von 1-3 mm; von 4-6 mm und > 7 mm wurden mit den Messergebnissen nach der Be-

handlung verglichen. Bei Taschentiefen von 4 mm oder mehr verringerten sich die Messwerte signifikant. Bei den Taschen von 4-6 mm. war der Unterschied zwischen den Taschentiefen vor und nach der Behandlung 0.9 ± 0.47 mm ($P < .0001$). Bei Taschen von 7 mm oder tiefer betrug der mittlere Unterschied 2.22 ± 1.35 mm ($P < .0001$). Die Reduktion der Taschentiefen und die Verbesserung der Attachmentniveaus hingen von dem anfänglichen Niveau der Schwere der Krankheit ab. Die Taschenreduktion war, zumindest teilweise, eine Folge der Verbesserung der Attachmentniveaus. Die Studie zeigt, dass die Schwere des klinischen Bildes der Parodontitis einen Monat nach der Hygienephase der Parodontaltherapie signifikant zurückgeht und dass die Indikation zu chirurgischer Taschenbehandlung nicht vor der Beendigung der Hygienephase zuverlässig beurteilt werden kann.

Résumé

Effets à court terme du traitement parodontal initial non chirurgical (phase hygiénique)

Des études longitudinales ont rendu compte de l'action de différentes méthodes de chirurgie parodontale sur la profondeur des culs-de-sac et le niveau de l'attachement par rapport aux mensurations faites avant traitement. Cependant, les modifications causées éventuellement par les détartrages, l'amélioration de l'hygiène bucco-dentaire et la rectification de l'articulation pendant la phase hygiénique n'ont pas été prises en considération. Le but du présent travail a été d'étudier l'action à court terme du traitement donné pendant la phase hygiénique chez 90 patients ayant quelques culs-de-sac allant jusqu'à 4 mm ou plus en direction apicale par rapport à la jonction émail-cément (CEJ). La profondeur des culs-de-sac et les niveaux de l'attachement par rapport à CEJ ont été mesurés avant traitement au moyen d'une fine sonde en cinq sites au niveau de chacune des 2355 dents de l'échantillon. Détartrages, polissages radicaux, instructions d'hygiène bucco-dentaire et rectification de l'articulation ont été accomplis en 4 à 6 séances chez chacun des patients.

Quatre semaines après la fin de la phase hygiénique, toutes les variables ont été enregistrées. Les mesures moyennes des profondeurs de culs-de-sac allant de 1-3 mm, 4-6 mm et ≥ 7 mm avant traitement ont été comparées avec les valeurs correspondantes après traitement. La profondeur des culs-de-sac diminuait

de façon significative pour les culs-de-sac allant à 4 mm ou plus en direction apicale par rapport au rebord gingival libre (FGM). Pour les culs-de-sac de 4-6 mm, il y avait une différence moyenne de $0,96 \pm 0,47$ mm ($P < 0,0001$) entre la profondeur des culs-de-sac mesurée avant et après le traitement. Pour les culs-de-sac de 7 mm ou plus, la différence moyenne était de $2,22 \pm 1,35$ mm ($P < 0,0001$). La réduction de la profondeur des culs-de-sac et l'amélioration du niveau de l'attachement étaient liées au niveau initial de la sévérité de l'atteinte. La réduction des culs-de-sac était due en partie à l'amélioration des niveaux de l'attachement. Cette étude a prouvé que la sévérité de l'atteinte clinique de parodontite est réduite significativement un mois après le phase hygiénique du traitement, et que l'on ne peut vraiment juger s'il est nécessaire de traiter les culs-de-sac par intervention chirurgicale avant la fin de la phase hygiénique du traitement parodontal.

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Address:

Department of Periodontics
The University of Michigan
School of Dentistry
Ann Arbor, Michigan 48109
U.S.A.

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