

4 modalities of periodontal treatment compared over 5 years*

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Ramfjord SP, Caffesse RG, Morrison EC, Hill RW, Kerry GJ, Appleberry EA, Nissle RR and Stults DL: 4 modalities of periodontal treatment compared over 5 years. *J Clin Periodontol* 1987; 14: 445-452.

Abstract. The purpose of the present study was to assess in a clinical trial over 5 years the results following 4 different modalities of periodontal therapy (pocket elimination or reduction surgery, modified Widman flap surgery, subgingival curettage, and scaling and root planing). 90 patients were treated. The treatment methods were applied on a random basis to each of the 4 quadrants of the dentition. The patients were given professional tooth cleaning and oral hygiene instructions every 3 months. Pocket depth and attachment levels were scored once a year. 72 patients completed the 5 years of observation. Both patient means for pocket depth and attachment level as well as % distribution of sites with loss of attachment ≥ 2 mm and ≥ 3 mm were compared.

For 1-3 mm probing depth, scaling and root planing, as well as subgingival curettage led to significantly less attachment loss than pocket elimination and modified Widman flap surgery. For 4-6 mm pockets, scaling and root planing and curettage had better attachment results than pocket elimination surgery.

For the 7-12 mm pockets, there was no statistically significant difference among the results following the various procedures.

Key words: Scaling - root planing - curettage - product elimination - modified Widman flap - probing depth - attachment level - tooth loss - furcations.

Accepted for publication 25 August 1986

In a previous paper (Hill et al. 1981), 2-year results from a clinical trial comparing surgical and non-surgical techniques for treatment of moderate to advanced periodontitis were published. The clinical results following the 4 different procedures were fairly similar. Several other investigators (Pihlstrom et al. 1981, Lindhe et al. 1982, Lindhe et al. 1984, Isidor et al. 1984) have also compared results following surgical and non-surgical periodontal therapy over as much as 6½ years (Pihlstrom et al. 1984) and reported that only minor differences occurred between methods with respect to probing depth and attachment level alterations. With the notoriously slow process of adult-type periodontitis even in the absence of periodontal therapy (Lindhe et al. 1983), and the limitations of probing in discerning small differences, the focus of interest in clinical trials involving various modalities of periodontal treatment should be more and more directed toward long-term observations involving as many patients as possible. If the

average annual loss of attachment for untreated cases of periodontitis is 0.2 mm (Lindhe et al. 1983), a crude instrument such as a probe with a unit scale of 1 mm obviously can only record trends based on numerous measurements over a long period of time.

It appears from previous observations that results of periodontal therapy become fairly stable over 5 years of observation (Knowles et al. 1979, Lindhe & Nyman 1984) with measurable changes only for very few teeth. It also becomes very difficult to keep an experimental group together for more than that length of time for well-controlled, standardized care. 5 years of observation should enable us to spot trends in behaviour of regularly repeated measurements including absorption of unavoidable errors.

Material and Methods

The types of patients and methods of treatment were reported in a previous paper (Hill et al. 1981), and will only be summarized here. 90 subjects with moderate to advanced periodontitis were treated. Following initial exami-

ation, they were treated with scaling, root planing and instruction in oral hygiene (hygiene phase of therapy) by a dental hygienist. Occlusal adjustment was subsequently performed by a periodontist. 4 modalities of periodontal treatment were randomized and performed by a periodontist. Thus, each of the 4 quadrants had an equal chance of receiving any one of the experimental procedures. The treatments were: (1) surgical pocket elimination (Prichard 1972) including bone surgery, or pocket reduction for the very deep pockets; (2) modified Widman flap surgery (Ramfjord & Nissle 1974); (3) subgingival curettage (Ramfjord & Ash 1979); (4) scaling and root planing only (Ramfjord & Ash 1979). All treatment procedures were performed under local anesthesia. The patients were recalled for prophylaxis once a week for 4 weeks post-surgically, and later once every 3 months for the 5 years of the study. The patients were reexamined 1 month after completion of the hygienic phase of treatment, and then yearly after the experimental surgical treatments. These re-examinations were performed 3 months after the last prophylaxis. Of

* This study was supported by Grant #DE02731.

the 90 initial patients, 72 completed the 5 years of follow-up.

Some pockets with overt bleeding and/or pus secretions when seen by the periodontist for annual evaluation were retreated by a periodontist during the maintenance phase. The modality of re-treatment was left to the judgement of the periodontist, but in most instances, scaling and root planing with or without anesthesia was carried out.

Results

Probing pocket depth and clinical attachment level

In order to keep the findings in perspective with the reported 2-year observations (Hill et al. 1981), some of the previously published data (Hill et al. 1981) are included in the present report.

The pockets were grouped into 3 classes at the initial examination: (1) 1 to 3 mm deep (normal depth); (2) 4 to 6 mm (moderate periodontitis); (3) ≥ 7 mm deep (advanced periodontitis).

Initial probing depth and attachment levels were used as baseline in order to assess the changes which occurred

following the various treatments over the 5 years. Patient means for probing pocket depths and clinical attachment levels within each category were used for the statistical tabulations. All of the teeth were included, and if a tooth was lost during the treatment, the measurements for that tooth were included until the tooth was lost. For parametric statistical evaluations, it was felt that the basic unit was the patient rather than the single tooth, or the single pocket. However, for a numerical evaluation of pockets with a certain amount of loss or gain, %s of changes were calculated. These changes will also be considered in this paper in an attempt to gain as much clinically applicable information as possible. This information is important to the clinician, since it relates to changes in attachment levels for special teeth and modalities of treatment.

The variations in depth for 1-3 mm (Class I) pockets were small (Table 1). Although some of the differences were significant statistically because of a large number of subjects and small standard deviations, they seemed insignificant from a clinical point of view. They

appeared mainly at the 1st year follow-up examination. After the second year, following the various modalities of treatment, there were no significant differences in this category of pocket. However, a slight deepening of the shallow pockets gradually occurred for all modalities of treatment when compared to the baseline data.

Of greater interest was the gradual loss of attachment that continued during the 5 years of treatment and maintenance for the Class I (normal) pockets (Table 2). Part of this loss was apparently the result of the initial treatment (1st year follow-up), where the loss following scaling and curettage was less than following the other surgical treatments. Also, there was a fairly similar loss of attachment during the maintenance phase for all of the treatment groups, but even at the 5th year, the curettage and scaling groups showed a more favorable attachment response than the flap surgery groups, although the differences were too small to be of clinical significance.

Pocket reduction for Class II (moderate periodontitis) (Table 3) was greater

Table 1. Pocket reduction (patient means) from baseline for pockets 1-3 mm by treatment method

Hygienic phase mean			1st year mean		2nd year mean		3rd Year mean		4th year mean		5th year mean			
N	difference	S.D.	Treatment	N	difference	S.D.	N	difference	S.D.	N	difference	S.D.		
90	0.17	0.23	pocket elim. curettage mod. Widman scaling and root planing	89	0.47*	0.30	80	0.23*	0.33	83	0.05	0.37		
		89		0.22*	0.30	80	0.05	0.39	83	-0.07*	0.34	75	-0.12*	0.30
		89		0.34*	0.32	80	0.09	0.46	83	-0.00	0.35	75	-0.07	0.35
		89		0.17*	0.33	80	0.04	0.34	83	-0.08	0.40	75	-0.13*	0.39
T 7.10 <i>P</i> < 0.0001				F=16.272 <i>P</i> < 0.0001		F=4.2209 <i>P</i> < 0.0061		F=2.3839 <i>P</i> < 0.0692		F=2.1195 <i>P</i> < 0.0978		F=2.0947 <i>P</i> < 0.1011		

Significant difference between means

* Specific treatment different from baseline *P* < 0.05.

Table 2. Attachment change (patient means) from baseline for pockets 1-3 mm by treatment method

Hygienic phase mean			1st year mean		2nd year mean		3rd year mean		4th year mean		5th year mean				
N	difference	S.D.	Treatment	N	difference	S.D.	N	difference	S.D.	N	difference	S.D.			
90	-0.04	0.28	pocket elim. curettage mod. Widman scaling and root planing	89	-0.64*	0.55	80	-0.82*	0.51	83	0.99*	0.55			
		89		-0.35*	0.40	80	-0.59*	0.47	83	-0.80*	0.49	75	-1.10*	0.57	
		89		-0.58*	0.43	80	-0.81*	0.53	83	-0.95*	0.51	75	-0.90*	0.54	
		89		0.27*	0.42	80	-0.50*	0.41	83	-0.69*	0.53	75	-0.98*	0.61	
				89	-0.27*	0.42	80	-0.50*	0.41	83	-0.69*	0.53	75	-0.78*	0.56
T 1.46 <i>P</i> < 0.1478				F=14.090 <i>P</i> < 0.0001		F=8.8426 <i>P</i> < 0.0001		F=5.7927 <i>P</i> < 0.0007		F=4.1904 <i>P</i> < 0.0063		F=3.5864 <i>P</i> < 0.0142			

Significant difference between means

* Specific treatment different from baseline *P* < 0.05.

Table 3. Pocket reduction (patient means) from baseline for pockets 4-6 mm by treatment method

Hygienic phase mean		Treatment	1st year mean		2nd year mean		3rd year mean		4th year mean		5th year mean							
N	S.D.		N	S.D.	N	S.D.	N	S.D.	N	S.D.	N	S.D.						
90	0.96	0.47	pocket elim.	89	1.81*	0.54	80	1.54*	0.70	83	1.27*	0.76	75	1.27*	0.67	72	1.29*	0.76
			curettage	87	1.30*	0.63	78	1.08*	0.76	81	1.00*	0.80	73	0.59*	0.54	70	0.65*	0.61
			mod. Widman	89	1.54*	0.73	80	1.42*	0.77	83	1.20*	0.94	75	1.19*	0.87	72	1.15*	0.88
			scaling and root planing	89	1.26*	0.66	80	1.16*	0.70	83	1.01*	0.74	75	0.95*	0.71	72	1.08*	0.70
T-19.28 $P < 0.0001$				F-13.527 $P < 0.0001$		F-7.1010 $P < 0.0001$		F-2.3258 $P < 0.0747$		F-13.848 $P < 0.0001$		F-9.6960 $P < 0.0001$						

Significant difference between means

* Specific treatment different from baseline $P < 0.05$.

1 year following both types of flap surgeries than following curettage or scaling. 5 years later, the same trend prevailed, with significantly more reduction following pocket elimination surgery than following curettage. The pocket reduction following scaling was similar to the reduction following open surgical treatments and significantly greater than following curettage. From a clinical standpoint, the differences were small for all of the methods. However, the pockets were reduced significantly from the baseline.

The attachment level response for Class II pockets (pocket depth 4-6 mm) 1 year after treatment was significantly better for scaling and for curettage than for both pocket elimination and modified Widman flap surgeries (Table 4). This trend was sustained over the 5 years, although there was a slight loss of attachment following all modalities of treatment. The greatest loss was following pocket elimination surgery. The loss seemed to occur mainly during the

maintenance phase, although it apparently become stabilized after the 3rd year.

For the deep pockets, ≥ 7 mm (Class III), there was a considerable reduction in pocket depth following the hygienic phase, and even greater 1 year following the various treatment modalities. The greatest reduction occurred following pocket elimination or reduction surgery and the least following scaling (Table 5). For all methods, the pocket reduction still remained significant after 5 years. However, the differences among the methods of treatment were small and not statistically significant.

There was a gain of clinical attachment following all 4 methods of treatment for the Class III pockets (≥ 7 mm) (Table 6). There was, however, no statistically significant difference among the methods during the 5 years of observation. At 5 years of maintenance, only curettage and scaling showed a statistically significant gain of attachment compared to the baseline data. The gain

observed in the other 2 groups was similar.

Frequency distribution of sites with gain or loss of clinical attachment

The frequency distribution of sites gaining or losing 2 mm or more and 3 mm or more of clinical attachment from baseline to year 5 was related to modality of treatment (Tables 7, 8). The sites with pocket depth of 1-3 mm (Class I) had the highest frequency of attachment loss both ≥ 2 mm and ≥ 3 mm, and a higher frequency of attachment loss for surgical procedures than for either curettage or scaling and root planing. Gains in this category were practically non-existent, and almost 90% of the treated sites were recorded as unaltered when changes of ≥ 3 mm were used as the basis for the counts. When pockets of 4-6 mm (Class II) were considered (Tables 7, 8), a higher % of attachment losers than gainers still

Table 4. Attachment change (patient means) from baseline for pockets 4-6 mm by treatment method

Hygienic phase mean		Treatment	1st year mean		2nd year mean		3rd year mean		4th year mean		5th year mean							
N	S.D.		N	S.D.	N	S.D.	N	S.D.	N	S.D.	N	S.D.						
90	0.23	0.38	pocket elim.	89	-0.22*	0.62	80	-0.41*	0.70	83	-0.79*	0.78	75	-0.70*	0.69	72	-0.71*	0.76
			curettage	87	0.15*	0.58	78	-0.19*	0.84	81	-0.37*	0.88	73	-0.51*	1.11	70	-0.27*	0.97
			mod. Widman	89	-0.11	0.67	80	-0.24*	0.85	83	-0.43*	0.86	75	-0.44*	0.98	72	-0.54*	0.97
			scaling and root planing	89	0.25*	0.61	80	-0.10	0.75	83	-0.26*	0.75	75	-0.33*	0.67	72	-0.32*	0.72
T-5.68 $P < 0.0001$				F-10.879 $P < 0.0001$		F-2.4431 $P < 0.0642$		F-6.7331 $P < 0.0002$		F-2.3059 $P < 0.0769$		F-4.0306 $P < 0.0079$						

Significant difference between means

* Specific treatment different from baseline $P < 0.05$.

Table 5. Pocket reduction (patient means) from baseline for pockets ≥ 7 mm by treatment method

Hygienic phase mean			1st year mean		2nd year mean		3rd year mean		4th year mean		5th year mean							
N	difference	S.D.	Treatment	N	difference	S.D.	N	difference	S.D.	N	difference	S.D.						
55	2.22	1.35	pocket elim. curettage mod. Widman scaling and root planing	31	4.17*	1.57	29	3.43*	1.68	30	3.38*	1.77	27	3.77*	1.75	26	3.53*	1.69
				29	3.57*	1.85	30	3.37*	1.87	28	3.36*	1.89	26	2.41*	1.77	24	2.28*	1.87
				30	3.41*	1.69	29	3.32*	1.35	29	3.10*	1.71	29	3.20*	1.61	27	3.13*	1.56
				33	2.85*	1.91	32	2.76*	1.65	30	2.91*	2.02	29	2.52*	1.97	28	2.92*	2.17
T-12.15 $P < 0.0001$				F-3.0588 $P < 0.0310$			F-1.0813 $P < 0.3599$			F-4.3524 $P < 0.7282$			F-3.4665 $P < 0.0188$			F-2.0053 $P < 0.1180$		

Significant difference
between means

* Specific treatment different from baseline $P < 0.05$.

Table 6. Attachment change (patient means) from baseline for pockets ≥ 7 mm by treatment method

Hygienic phase mean			1st year mean		2nd year mean		3rd year mean		4th year mean		5th year mean							
N	difference	S.D.	Treatment	N	difference	S.D.	N	difference	S.D.	N	difference	S.D.						
55	0.91	0.95	pock. elim. curettage mod. Widman scaling and root planing	31	0.69*	1.39	29	0.30	1.40	30	0.36	1.44	27	0.54	1.81	26	0.43	1.83
				29	1.45*	2.03	30	0.86*	1.86	28	0.87	2.37	26	1.16*	2.61	24	1.04*	2.62
				30	1.16*	1.66	29	0.58*	1.57	29	0.50	2.40	29	0.79	2.51	27	0.63	2.12
				33	0.99*	1.60	32	0.47	2.49	30	0.68*	1.78	30	0.30	1.73	28	0.59*	1.95
T 7.12 $P < 0.0001$				F-1.0810 $P < 0.3599$			F-0.49077 $P < 0.6894$			F-0.33314 $P < 0.8014$			F-0.78344 $P < 0.5057$			F-0.36778 $P < 0.7764$		

* Specific treatment different from baseline $P < 0.05$.

appeared, but the advantage for curettage and scaling with root planing sites was less noticeable than for the 1–3 mm pockets. If, however, a variation of ≥ 2 mm was used for the cut-off point, scaling and root planing had a higher % of attachment gainers than any of the other procedures, and higher than curettage, which was not the case when mean values were considered (Table 4). These differences however, were small and the % of sites was very similar for all of the 4 procedures. For Class III pockets, (≥ 7 mm), there were more sites which gained attachment than lost. Curettage had the highest % of both of attachment gain and loss, while pocket

elimination showed the most stable results. However, the frequency distribution data should be considered with caution, since so few sites were included. However, it is worth noticing that attachment losses of ≥ 2 or of ≥ 3 mm were relatively rare. This indicates that very few sites with pocket depth of ≥ 7 mm, regardless of method of treatment, lost attachment of 2 mm or more over 5 years.

Loss of teeth

Of the original 90 patients with 2401 teeth, 28 teeth were lost. 72 patients with

1881 teeth initially, completed the 5-year study. They lost a total of 22 teeth (3 during surgery, 1 during the 1st year of maintenance, 0 during the 2nd year, 10 during the 3rd year, 3 during the 4th year, and 5 during the 5th year). 17 of these teeth were lost for periodontal reasons, and 16 of the 17 teeth had furcation involvement at baseline. Thus, less than 1% of the treated teeth were lost for periodontal reasons during the 5 years. Of these 17 teeth, 5 had been treated originally with pocket elimination, 4 with curettage, 6 with modified Widman flap, and 2 with scaling and root planing. 5 teeth were extracted for non-periodontal reasons.

Table 7. Frequency distribution of sites gaining or losing 2 mm or more of clinical attachment after 5 years according to treatment and initial probing depth

	N	1–3 mm			N	4–6 mm			N	7–12 mm		
		gain	same	loss		gain	same	loss		gain	same	loss
pocket elimination	1497	18 1.2%	908 60.7%	571 38.1%	772	51 6.6%	495 64.1%	226 29.3%	65	12 18.5%	46 70.8%	7 10.8%
curettage	1611	22 1.4%	1048 65.1%	541 33.6%	659	60 9.1%	450 68.3%	149 22.6%	55	18 32.7%	31 56.4%	6 10.9%
modified Widman flap	1554	18 1.2%	986 63.4%	550 35.4%	649	46 7.1%	422 65.0%	181 27.9%	62	14 22.6%	43 69.4%	5 8.1%
scaling and root planing	1604	26 1.6%	1092 68.1%	486 30.3%	705	81 11.5%	475 67.4%	149 21.1%	61	18 29.5%	34 55.7%	9 14.8%

Table 8. Frequency distribution of sites gaining or losing 3 mm or more of clinical attachment after 5 years according to treatment and initial probing depth

	1-3 mm			4-6 mm				7-12 mm				
	N	gain	same	loss	N	gain	same	loss	N	gain	same	loss
pocket elimination	1497	4 0.3%	1288 86.0%	205 13.7%	772	14 1.8%	684 88.6%	74 9.6%	65	5 7.7%	59 90.8%	1 1.5%
curettage	1611	4 0.2%	1441 89.4%	166 10.3%	659	18 2.7%	588 89.2%	53 8.0%	55	9 16.4%	42 76.4%	4 7.3%
modified Widman flap	1554	3 0.2%	1359 87.5%	192 12.4%	649	12 1.8%	569 87.7%	68 10.5%	62	7 11.3%	52 83.9%	3 4.8%
scaling and root planing	1604	3 0.2%	1453 90.6%	148 9.2%	705	19 2.7%	629 89.2%	57 8.1%	61	9 14.8%	49 80.3%	3 4.9%

Retreatment

When bleeding and pus secretion following mild provocation occurred 2-3 weeks after prophylaxis, the periodontist decided what teeth to retreat and which modality of retreatment to use. Flap surgery was not performed in quadrants which had been treated with curettage or scaling alone. Some teeth with overt bleeding tendency but without pus were also retreated. Some teeth with apparently hopeless furcation involvement were not retreated. A total of 101 teeth in 24 patients were retreated. The original treatment of these teeth had been:

surgical pocket elimination - 16 teeth;

curettage - 20 teeth;

modified Widman flap - 21 teeth;

scaling and root planing - 44 teeth.

7 teeth in 2 patients were retreated with modified Widman flap surgery; all of the others were retreated with scaling and root planing, with or without curettage and usually under local anaesthesia.

Of the retreated 101 teeth, only 2 were subsequently lost. 1 of these teeth had originally had surgical pocket elimination; the other had had curettage, and they were both retreated with scaling and curettage.

Discussion

The gradual loss of attachment over time for sites with shallow pockets, regardless of initial treatment is a disturbing but common observation (Hill et al. 1981, Pihlstrom et al. 1981, Lindhe et al. 1982, Isidor et al. 1984, Knowles et al. 1979). It has been suggested (Lindhe et al. 1982) that this phenomenon may be a consequence of the frequent mechanical disturbance of the marginal

attachment apparatus during the repeated recall sessions. However, 1 year after treatment, there was a significantly greater loss for pocket elimination and modified Widman flap. Most of these differences were maintained over 5 years, indicating some influence of the modality of treatment (Table 2). The loss continued during the 5 years, but the initial differences between the treatment groups became smaller over time. This may indicate that in addition to an initial loss related to treatment, there was a gradual loss during the maintenance phase. The pocket depth stayed close to baseline from years 3-5 (Table 1), indicating that the attachment loss observed was accompanied by gingival recession. It was shown by O'Leary et al. (1971) that most gingival recessions occurred in patients with efficient oral hygiene, and thus a mechanical effect of oral hygiene procedures may be suspected. A preliminary comparison of plaque indices and loss of attachment for these shallow pockets indicated that the loss of attachment was not greater with plaque index 0 than with plaque index of 2, which would tend to rule out recession from overzealous toothbrushing as a cause of the loss. Data related to plaque scores will be reported in a separate paper. This loss of clinical attachment for shallow pockets during treatment and maintenance appears to occur at a faster rate than the common loss associated with aging in well-cared for populations (Suomi et al. 1971, Loe et al. 1978). Over the years, there appears to be an equalization process of gingival height taking place after periodontal treatment. This equalization has also been pointed out by Rosling et al. (1976) for intrabony lesions. This natural tendency for recontouring and

rebound may explain some of the recession associated with shallow crevices, since they initially had the least loss of attachment. However, from this and long-term studies (Lindhe et al. 1982, Badersten et al. 1984), it appears that the minute loss of attachment in shallow pocket does not represent a threat to the future maintenance of the dentition.

The magnitude of pocket reduction for 4-6 mm pockets (Table 3) varied significantly according to the method of treatment for the first 2 years post-operatively. However, after 5 years, there was no difference in reduction after scaling compared with the reduction after pocket elimination surgery, and some of the differences which were statistically significant appeared to be too small to be of any clinical significance. Although the pockets were significantly reduced compared to baseline, after 5 years, the reduction was minimal beyond that which occurred as a result of the initial, presurgical hygienic phase of treatment. When attachment levels were considered for the 4-6 mm pockets (Table 4), the long-term effect was a slight loss of attachment. This loss of attachment was significantly more pronounced for pocket elimination surgery than for the curettage and the scaling procedures. These findings differ from what were reported in a previous study (Knowles et al. 1979), and a further examination of the data revealed that in the present study, the majority of the pockets in the 4-6 mm class was 4 mm, while in the other study (Knowles et al. 1979), there was in this probing depth class a much higher % of 6 mm deep pockets. This difference in response to various treatment modalities related to pocket depth has been discussed in detail in a recent paper by Lindhe et al.

(1982). A slight additional attachment loss (Table 4) appeared in this pocket depth class after 5 years for all of the treatment modalities. It is important to note that the 5-year effects on the attachment levels for 4-6 mm pockets were almost identical for curettage and for scaling. Attachment level responses for scaling and for curettage for these pockets were significantly better than for pocket elimination surgery. Since scaling and root planing are basic procedures for all periodontal therapy, and gave results that were as good or better than for surgical techniques for 4-6 mm pockets, scaling and root planing appear to be the treatment of choice for sites with 4-6 mm deep pockets. When access for effective scaling cannot be gained without surgery, as in the presence of furcation involvement, flap surgery for access is obviously indicated. Similar, or even better results, following scaling in pockets of this depth have been reported over 6½ years by Pihlstrom et al. (1984). They reported significant gain of attachment after scaling in sites with 4-6 mm deep pockets for the entire period of observation. The attachment levels for the deep pockets (Class III ≥ 7 mm) were maintained above the baseline level for all of the treatment methods with no significant difference among them (Table 6). Changes in attachment levels from year-to-year were very small as reported by others (Pihlstrom et al. 1984, Knowles et al. 1979). This trend of similar results from the various procedures tend to be at variance with a commonly expressed belief that scaling and root planing are improper procedures to use in the treatment of deep pockets. However, the present results seem to confirm findings by Badersten et al. (1984) for single-rooted teeth.

It is becoming increasingly evident that complete removal of all calculus and residual plaque from root surfaces exposed in deep periodontal pockets is not commonly attained (Caffesse et al. 1985, Eaton et al. 1985, Rabbani et al. 1981).

Data from research and clinical experience indicate that less deposits are left behind when root planing is done after flap elevation than after "non-surgical" subgingival scaling. The fact that in this study, 44 teeth had to be retreated in the quadrants that initially had been scaled and root planed compared with about 20 for the other treatment methods, may also be taken as an indi-

cation that removal of accretions was less successful following scaling than following the other methods. However, the longitudinal results of scaling were as good as for the other procedures with regard to maintenance of attachment level and prevention of loss of teeth. Furthermore, the retreatment by scaling was highly successful in arresting the progress of the attachment loss for practically all of the retreated teeth. The loss of teeth was lower in this study than in previous studies where no retreatment by the periodontist was performed except for treatment of abscesses (Knowles et al. 1979). It was also interesting to note that 16 of the 17 teeth lost from periodontal disease had furcation involvement. This confirms the assumption that the prognosis for single-rooted teeth is better than for teeth with furcation involvement.

The well-known problems associated with less than perfect reproducibility of probing pocket measurements makes a % comparison of loss or gain or attachment (tinted with unavoidable errors, especially for the deep pockets. The chances for making errors decrease as the level of tolerance increases, but such errors may occur even at 3 mm levels. This makes standardization of the error difficult, and one can never properly determine how many apparent "gains" or "losses" were in fact measurement errors.

It should be understood that the results listed in Tables 7 and 8 do not indicate that the sites presented under "same" had the same measurements each time; only that the variations were less than 2 mm. Even if the measurements were the same, the attachment levels may have shown variations due to the inherent errors in the use of the probe. It should therefore be acknowledged that at the present time we can only measure trends of attachment level changes.

Speculations regarding time requirements for the various procedures cannot be answered by data from this study. All of the patients received initial scaling and instruction in oral hygiene by a dental hygienist who spent from 5 to 8 h with each patient. Then, the periodontist was allotted an average of 1½ h to each quadrant for the treatment, regardless of which procedure he was scheduled to perform.

Thus, in this study, there was no difference in time spent for each procedure. If one were to save time doing

surgery, compared with scaling and root planing alone, the surgery would have to be done without prescaling in the numerous shallow pockets where the results of scaling alone are often better than after surgery (Pihlstrom et al. 1984). As a consequence, the most sensible clinical approach seems to be scaling and instruction by a hygienist, with re-examination 4-6 weeks later by the dentist. If there is no bleeding from the bottom of the pocket with gentle probing and no pus can be provoked, it can be assumed that the progress of the disease is arrested and the area is ready for maintenance care. If the site does not heal, and bleeding and/or pus can be provoked, the dentist must decide what procedure to use to clean that particular root surface. This will depend on access, especially for furcations which are usually more easy to reach during flap surgery than during "non-surgical" subgingival scaling. Deliberate soft-tissue curettage does not seem to enhance the results of scaling or root planing.

Unquestionably, flap elevation will facilitate access to the root surfaces with furcation involvement or tortuous deep pockets and should be used at the discretion of the operator. However, emphasis should be placed on thorough scaling and root planing initially and at the time of surgery. It also appears that retreatment (with or without surgery) should be a routine consideration beyond the "recall prophylaxis" or professional tooth cleaning during the maintenance phase of therapy. Mechanical periodontal therapy cannot be standardized as drug prescriptions, and the results of clinical trials will only indicate probable outcome of various treatments when performed under the standardized conditions of the trial, and with personnel with similar training.

Conclusions

Scaling and root planing was the treatment of choice for periodontal pockets of ≥ 6 mm, provided hereby proper access to the root surface could be obtained. For pockets of ≥ 7 mm, the results were similar for all of the 4 methods of treatment examined. There was no additional benefit from curettage over scaling and root planing. Maintenance care should include retreatment of pockets with persistent pus

secretion and/or bleeding. Regardless of the modality of treatment, furcation involvement was the greatest hazard in the prognosis. Retreatment was needed more often after scaling and root planing than after the other procedures, but with additional scaling, the results were as good as for any other procedure.

Zusammenfassung

Ein 5-Jahresvergleich zwischen 4 Modalitäten der Parodontalbehandlung

Mit der hier vorliegenden Studie wurde beabsichtigt, die Resultate der folgenden 4 Modalitäten parodontaler Therapie (Tascheneliminations- oder -reduktionschirurgie, die Technik des modifizierten Widmanlappens, subgingivale Kurettage und Zahnsteinentfernung mit Wurzelglättung) während eines 5 Jahre andauernden klinischen Versuchs zu bestimmen. 90 Patienten wurden behandelt. Die Behandlungsmethoden wurden zufällig für jeden der 4 Gebissquadranten bestimmt. In jedem 3. Versuchsmonat wurden die Zähne der Patienten professionell gereinigt. Die Tiefe der Taschen und die Attachmentniveaus wurden einmal jährlich beurteilt. 72 Patienten standen während der gesamten Behandlungszeit zur Verfügung. Sowohl die Mittelwerte der Taschentiefen, der Attachmentniveaus als auch die prozentuale Verteilung der "Seiten" mit Attachmentverlusten von ≥ 2 mm und ≥ 3 mm wurden miteinander verglichen. Bei 1-3 mm Sondierungstiefe führten sowohl Zahnsteinentfernung und Wurzelglättung als auch die subgingivale Kurettage zu signifikant weniger Attachmentverlust als die Taschenelimination und die modifizierte Widman'sche Lappenchirurgie. Bei 4-6 mm tiefen Taschen hatte Zahnsteinentfernung und Wurzelglättung sowie Kurettage hinsichtlich der Position des Attachments bessere Ergebnisse als die chirurgische Taschenelimination. Bei den 7-12 mm Taschen wurden keine statistisch abgesicherten Unterschiede zwischen den Resultaten der verschiedenen Behandlungsmodalitäten gesehen.

Résumé

Traitement parodontal: comparaison de 4 modes de traitement sur 5 ans

Le but du présent travail était d'évaluer pendant 5 ans par une étude clinique les résultats obtenus par traitement parodontal suivant 4 modes de traitement différents (élimination ou réduction chirurgicale des poches, opération à lambeau de Widman modifiée, curta-

ge sous-gingival et détartrage avec surfaçage radiculaire). Le traitement a porté sur 90 patients. Pour chacun des 4 quadrants de la bouche, les méthodes de traitement appliquées ont été choisies au hasard. Les patients recevaient tous les 3 mois un nettoyage dentaire professionnel et des instructions d'hygiène bucco-dentaire. Les observations ont pu être menées sur les 5 années chez 72 pa-

tients. Les valeurs moyennes de la profondeur des poches et du niveau de l'attache par patient et la distribution de fréquence des localisations présentant une perte d'attache de ≥ 2 mm et ≥ 3 mm ont été comparées. Pour les profondeurs de sondage de 1-3 mm, le détartrage avec surfaçage radiculaire, ainsi que le curetage sous-gingival résultaient en une perte d'attache significativement moins

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marquée que l'élimination chirurgicale des poches et l'opération à lambeau de Widman modifiée. Pour les poches de 4-6 mm, le détartrage avec surfaçage radiculaire et le curetage sous-gingival donnaient de meilleurs résultats du point de vue de l'attache que l'élimination chirurgicale des poches. Pour les poches de 7-12 mm, il n'y avait pas de différence statistiquement significative entre les résultats obtenus avec les différentes méthodes.

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