Results Following Three Modalities of Periodontal Therapy*

by
SIGURD P. RAMFJORD, L.D.S., PH.D.†
JAMES W. KNOWLES, D.D.S., M.S.†
ROBERT R. NISSLE, D.D.S., M.S.†
FREDERICK G. BURGETT, D.D.S., M.S.†
RICHARD A. SHICK, D.D.S., M.S.†

CONVINCING EVIDENCE of new connective tissue[1] and epithelial attachment[2] following periodontal therapy has revived the interest in therapeutic methods aimed at reattachment. Although new attachment has been reported following several modalities of treatment,[3-5] there is a remarkable lack of data from controlled clinical trials to indicate the short and long term potential for gain or loss of periodontal attachment following treatment.

Some treatment methods such as subgingival curettage and Widman flap surgery[6] are more specifically aimed at reattachment than pocket elimination surgery which basically is aimed at stopping the progress of destructive periodontal disease through surgical elimination of periodontal tissues coronally to the most apical extent of the pockets, and to restore surgically a "physiologic" gingival contour at that level.

In selection of periodontal therapy the main concern is to maintain as much attachment for the teeth as possible for the lifetime of the individual. Whether this goal can be served best by therapy aimed primarily at reattachment or by surgical pocket elimination still is a highly controversial issue.

The purpose of the present study was to compare over a period of five years results following two methods aimed at combined reattachment and surgical pocket reduction (i.e. subgingival curettage and modified Widman flap surgery) with results following attempted complete surgical pocket elimination and restoration of gingival contour.

METHOD

The criteria for acceptance of patients and for scorings were the same as published in our previous studies.[7, 8] Calibration tests before and during the study indicated that the scoring errors would have an insignificant effect on the total results reported in this paper.

After examination and scoring, all patients had initial treatment consisting of scaling, initial root planing, instruction in oral hygiene, and occlusal adjustment. They also received emergency dental care and recommendations to have dental restorations placed in carious lesions.

As in our previous studies,[8] the teeth in one half of the mouth (divided in the midsagittal plane between the central incisors) constituted the experimental unit. The means from measurements and scores for individual teeth within this unit were used for clinical evaluation and for statistical analysis of results.

Using the analysis of variance to test for significant differences between the three modalities of treatment does not maximize the power of the analysis since the advantage of the paired treatment design was not fully utilized. This resulted in conservative significance levels for the analysis of variance which were considered to be appropriate considering the small clinical magnitudes of the differences. With three treatment modalities for either the left or the right side of the mouth there were six possible combinations for each patient. One of these six combinations was assigned to each patient using a table of random numbers as he entered the study.

The subgingival curettage and the surgical pocket elimination were performed as described in previous reports.[7, 8] The Widman flap surgery was modified as described recently.[9]

All patients were recalled for prophylaxis by a dental hygienist every three months, and rescored every year following the initial treatment by the investigator who did the original scoring.

All patients admitted to the study after July 1, 1966 were included in this routine. Results from patients treated prior to that time were not in any way included in the present report since it is essential for fair comparison of the results that each method of treatment had equal chance to be compared with the other methods of treatment in the same patients, performed at the same time, and by the same therapists. Unfortunately it is, for practical reasons, impossible to start all patients at the same time, and they cannot be completed at the same time. Thus we had to organize our data on the basis of time intervals of years following the initial treatment. Most of the patients included in this report had their initial treatment in 1967 to 1969, but a few have been admitted later. The cut off date for the data included in this report was December 31, 1973.

SAMPLE

A total of 82 patients had their periodontal treatment completed in the study. The present report is based on followup results in 79 patients. Eighteen patients have been lost, and at the time when the present data was compiled (December 31, 1973) there were 64 patients

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† The University of Michigan School of Dentistry, Department of Periodontics, Ann Arbor, Mich. 48104.

actively participating in the study. Thus, results from some of the patients who have dropped out of the study were included in this report.

The age range of the patients included in this report is 19 to 61 years, with a mean age of 39.6 years, S.D. 13.12.

The mean initial pocket depth at the mesiobuccal line angle was 3.95 mm., S.D. 1.598, at the distobuccal line angle 3.77 mm., S.D., 1.656. The mean loss of attachment at the mesiobuccal line angle was 3.11 mm., S.D. 2.006, at the distobuccal line angle 3.41 mm., S.D. 2.143.

Results

On the basis of averaging the individual scores for loss of attachment and pocket depth for all of the teeth in each half mouth, a mean patient score for that half mouth was computed. These means of half mouth patient scores were used as the basic units for all statistical evaluation of results.

In order to evaluate how each of the three experimental treatment modalities affected the attachment level and pocket depth with time, means were calculated for changes in attachment level and pocket depth at yearly intervals up to five years. All subsequent scores were related to the initial scores (prior to treatment).

The mesial plus distal changes in attachment levels with time following each of the modalities of treatment are reported in Table I.

It appears that subgingival curettage resulted in a statistically significant gain of attachment for the three first years following the initial treatment, whereas only a moderately significant gain occurred one year after the Widman flap surgery, and there was a slight but statistically insignificant loss of attachment following surgical pocket elimination.

Table I. *Interproximal (M+D) Gain or Loss (−) of Attachment in mm*

Years	Patients	Mean	S.D.	S.E.
		Curettage		
1	49	0.68*	1.123	0.160
2	49	0.42*	1.083	0.155
3	39	0.44*	1.039	0.166
4	34	0.02	1.159	0.199
5	26	0.04	1.162	0.228
		Widman		
1	38	0.43†	1.305	0.212
2	42	0.18	1.270	0.196
3	29	−0.02	1.170	0.217
4	37	−0.08	1.341	0.221
5	21	0.20	0.990	0.216
		Pocket Elimination		
1	59	0.09	1.163	0.151
2	63	−0.12	1.195	0.151
3	55	−0.06	1.143	0.154
4	49	−0.40†	1.292	0.185
5	31	−0.18	1.264	0.227

* = $P < 0.01$.
† = $P < 0.05$.

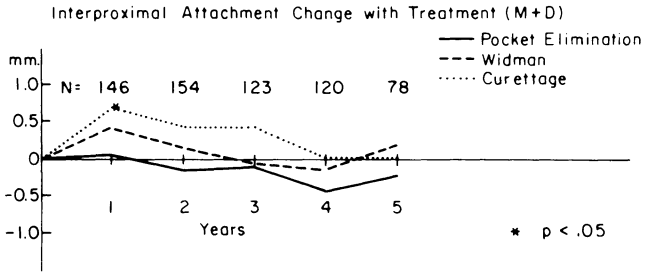

Figure 1

Table II. *Interproximal (M+D) Pocket Reduction in mm*

Years	Patient	Mean	S.D.	S.E.
		Curettage		
1	51	2.50*	1.627	0.228
2	50	1.96*	1.520	0.215
3	40	1.84*	1.610	0.255
4	35	1.42*	1.557	0.263
5	28	1.26*	1.578	0.298
		Widman		
1	38	2.75*	1.465	0.238
2	42	2.29*	1.527	0.236
3	29	1.92*	1.440	0.267
4	37	1.86*	1.475	0.242
5	21	1.89*	1.558	0.340
		Pocket Elimination		
1	61	3.14*	1.334	0.171
2	64	2.45*	1.360	0.170
3	56	2.22*	1.396	0.186
4	51	1.87*	1.936	0.271
5	34	1.77*	1.404	0.241

* = $P < 0.01$

Analysis of variance showed a significant difference between the results of the three modalities of treatment only for the first year of follow up (Fig. 1).

The mesial plus distal reduction of pocket depth was statistically significant for all of the methods over the five years (Table II). There was no significant variation between the results of the three methods (Fig. 2).

A generally increasing loss of attachment with time occurred on the buccal aspect of the teeth following all three methods (Table III). The loss was statistically significant for all of the mean values except for curettage the first year after the treatment. Only the first year of follow up showed a significant variation in the results (Fig. 3).

The reduction in depth of buccal pockets was statistically significant up to three years after curettage, five years following Widman flap surgery, and four years after surgical pocket elimination (Table IV). Analysis of variance did not indicate any significant differences between the results of the three methods (Fig. 4).

On the lingual aspects of the teeth, a statistically significant gain of attachment one year following subgin-

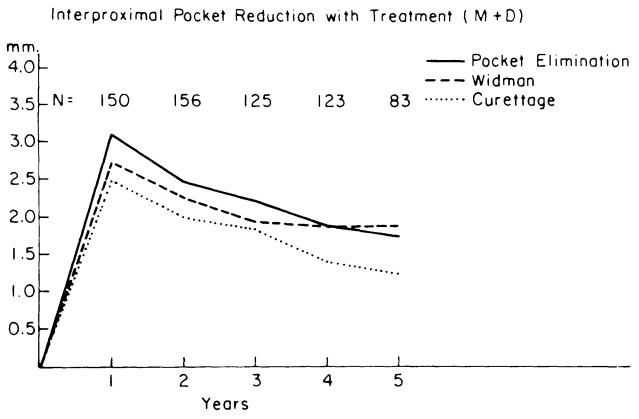

FIGURE 2

TABLE III. *Buccal (B) Loss (−) of Attachment in mm*

Years	Patients	Mean	S.D.	S.E.
		Curettage		
1	51	−0.11	0.536	0.075
2	50	−0.29*	0.572	0.081
3	40	−0.33*	0.542	0.086
4	35	−0.50*	0.574	0.097
5	28	−0.61*	0.640	0.121
		Widman		
1	38	−0.22†	0.648	0.105
2	42	−0.34*	0.580	0.090
3	29	−0.48*	0.596	0.111
4	37	−0.46*	0.603	0.099
5	21	−0.48*	0.531	0.116
		Pocket Elimination		
1	61	−0.41*	0.552	0.071
2	64	−0.46*	0.618	0.077
3	56	−0.56*	0.514	0.069
4	51	−0.74*	0.654	0.092
5	33	−0.74*	0.687	0.120

* $P = < 0.01$.
† $P = < 0.05$

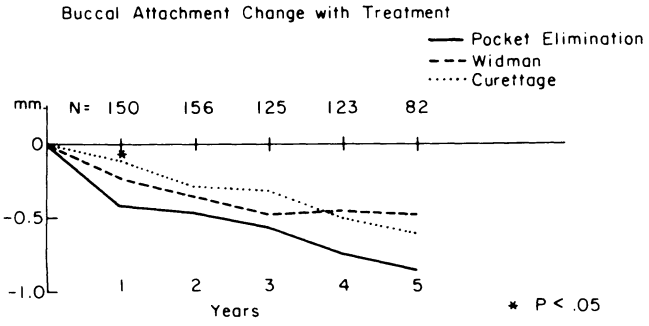

FIGURE 3

gival curettage was gradually reduced and turned into significant loss after five years (Table V). A slight gain of attachment one year after Widman flap surgery turned into a statistically significant loss for the following four years. Pocket elimination surgery resulted in a statistically significant loss of attachment for all of the five years follow up. Statistically significant differences be-

TABLE IV. *Buccal (B) Pocket Reduction or Increase (−) in mm*

Years	Patients	Mean	S.D.	S.E.
		Curettage		
1	51	0.48*	0.580	0.081
2	50	0.38*	0.526	0.074
3	40	0.24*	0.518	0.082
4	35	0.10	0.527	0.089
5	28	−0.07	0.577	0.109
		Widman		
1	38	0.68*	0.474	0.077
2	42	0.53*	0.416	0.064
3	29	0.32*	0.410	0.076
4	37	0.37*	0.453	0.074
5	21	0.26*	0.460	0.100
		Pocket Elimination		
1	61	0.71*	0.556	0.071
2	64	0.51*	0.486	0.061
3	56	0.35*	0.488	0.065
4	51	0.19†	0.600	0.084
5	34	0.05	0.534	0.092

* = $P < 0.01$.
† = $P < 0.05$.

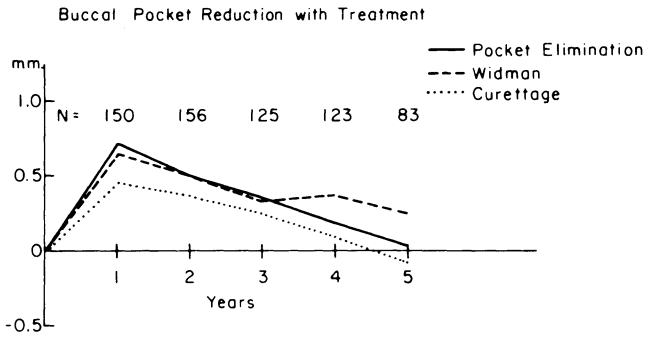

FIGURE 4

TABLE V. *Lingual (l) Gain or Loss (−) of Attachment in mm*

Years	Patients	Mean	S.D.	S.E.
		Curettage		
1	49	0.33*	0.565	0.081
2	49	0.14	0.550	0.079
3	39	0.10	0.679	0.109
4	34	−0.09	0.667	0.114
5	26	−0.32*	0.571	0.112
		Widman		
1	38	0.02	0.560	0.091
2	42	−0.17*	0.512	0.079
3	29	−0.33*	0.528	0.098
4	37	−0.34*	0.536	0.088
5	21	−0.34*	0.501	0.109
		Pocket Elimination		
1	59	−0.20*	0.528	0.069
2	63	−0.23*	0.624	0.079
3	55	−0.29*	0.649	0.088
4	49	−0.48*	0.677	0.097
5	32	−0.44*	0.522	0.092

* = $P < 0.01$.

tween the results following the three methods of treatment appeared for the first four years of follow up (Fig. 5), but at five years of follow up the differences were not significant.

The reduction of the lingual pockets was statistically significant for all three methods over the five years of follow up (Table VI). Analysis of variance showed significant differences between the results at the first and the third year of follow up (Fig. 6).

Significance

The interproximal loss of periodontal attachment is generally considered to be the greatest challenge in periodontal therapy, and surgical elimination of periodontal pockets with gingival contouring in these areas often involves bone removal and apical positioning of both buccal and lingual attachment levels.

In the present study curettage resulted in the most favorable response with statistically significant gain of interproximal attachment up to three years following the initial treatment (Table I). However, the attachment levels were maintained fairly well also following the two other experimental procedures, and after two years of follow up there was no significant difference between the results from the three procedures.

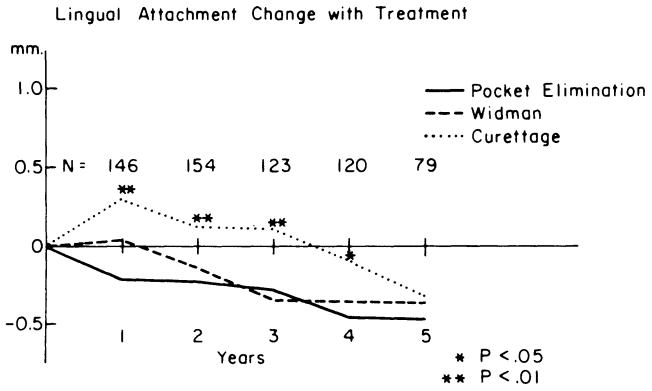

FIGURE 5

TABLE VI. *Lingual (L) Pocket Reduction in mm*

Years	Patients	Mean	S.D.	S.E.
		Curettage		
1	51	0.82*	0.690	0.097
2	50	0.62*	0.675	0.096
3	40	0.54*	0.689	0.109
4	35	0.50*	0.739	0.125
5	28	0.23†	0.560	0.106
		Widman		
1	38	1.02*	0.596	0.097
2	42	0.77*	0.556	0.085
3	29	0.61*	0.529	0.098
4	37	0.58*	0.550	0.090
5	21	0.47*	0.504	0.110
		Pocket Elimination		
1	61	1.20*	0.666	0.085
2	64	0.90*	0.629	0.079
3	56	0.86*	0.697	0.093
4	51	0.65*	0.757	0.106
5	34	0.52*	0.615	0.105

* = $P < 0.01$.
† = $P < 0.05$.

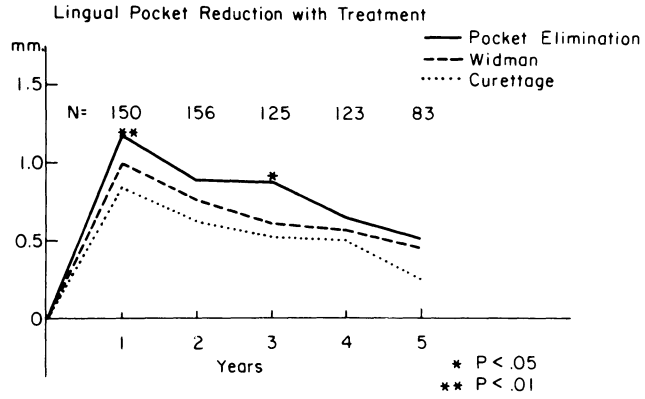

FIGURE 6

Significant pocket reduction was maintained for all three methods of treatment over the entire time of observation. Although this reduction initially was greatest following pocket elimination surgery, the differences in results from the three methods were not significantly different.

Thus surgical elimination of bony craters does not seem to be justified for maintenance of interproximal attachment levels, and does not offer any greater long term reduction in pocket depth than subgingival curettage or modified Widman flap surgery.

The most disappointing result from a clinical standpoint was the gradual and significant loss of buccal attachment following all three methods of treatment. Although this loss was significantly less following curettage the first year, there was no significant difference between the three methods over two to five years of follow up.

There is no obvious explanation for this buccal loss of attachment. Possible relations to furcation involvement will be explored.

The buccal pockets were reduced significantly for the first three years following curettage and pocket elimination surgery and for all five years following the Widman procedures. However, the mean reduction was small for all procedures and pocket depth tended to return to pretreatment levels five years after the initial treatment.

There also was a gradual loss of attachment with time on the lingual aspects of the teeth, but less than on the buccal aspects. Since the buccal and lingual aspects of teeth are cleaned more easily than the interproximal areas it does not seem likely that oral hygiene has anything to do with the end result of significant buccal loss of attachment.

Our previously published[7, 8] results concerning subgingival curettage and surgical pocket elimination were confirmed in the present study. Subgingival curettage gave the most favorable result regarding attachment

levels and was least effective in pocket reduction. Although pocket elimination surgery reduced pocket depth most effectively it was least effective in maintenance of attachment levels. The results from the modified Widman flap procedure assumed a position between these two extremes. Most of these differences were not statistically significant, and from a clinical standpoint the differences do not seem to favor clearly one procedure over another. This means that the clinician may make his choice of procedures on the basis of convenience of performing the procedures, esthetics, root exposure and potential for oral hygiene maintenance.

Summary and Conclusions

Three methods for treatment of periodontal pockets (subgingival curettage, modified Widman flap surgery, and pocket elimination) were applied as a clinical trial to 82 patients. Follow up results over one to five years after the initial treatment are reported. The variations in attachment levels and pocket depth were analyzed statistically as related to methods of treatment and yearly time intervals following the initial treatment.

The most favorable results regarding gain or maintenance of attachment levels and reduction of pocket depth were observed interproximally. Subgingival curettage provided the greatest gain in attachment level up to three years postoperatively, but after four to five years there was no significant difference in results following the three methods.

The most significant loss of attachment and return of pocket depth occurred on the buccal aspects of the teeth, and the results were not significantly different for the three methods except at the first year of follow up when the attachment level was maintained best after curettage.

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Abstracts

Biochemical Aspects of Calculus Formation. II. Comparative Studies of Saliva in Heavy and Light Calculus Formers

Mandel, I. D.

J Periodont Res **9:** 211, No. 4, 1974.

Calculus formers were examined in an effort to identify factors responsible for individual variations in the amount and rate of salivary calculus formation, by examining their submaxillary and parotid secretions. The 20 heavy calculus formers formed supragingival calculus at a rate requiring scaling every two to three months as verified over a period of at least a year, whereas the 20 light calculus formers had no discernible supragingival calculus for at least one year following a prophylaxis and all subjects had received instruction and been shown adequate oral hygiene. Saliva samples collected two hours after breakfast were assayed for total calcium, magnesium, and phosphorus and for lysozyme and acid phosphatase activity. Individual and pooled submaxillary and parotid samples of five subjects from each group were subjected to other tests. The mean calcium concentration of submaxillary saliva was significantly higher in heavy calculus formers and appeared to indicate that the submaxillary calcium concentration could be a factor in rate of calculus formation. No significant differences in submaxillary magnesium, phosphorus, or parotid calcium and phosphorus was shown. Lysozyme activity, but not acid phosphatase, was significantly lower in heavy formers which suggested that the alteration of bacterial cell walls can affect calculus formation. The electrophoretic and immunochemical studies strongly suggest that there are no proteins present in saliva of heavy calculus formers that are absent in light formers. However, differences in quantities of the various salivary proteins exist in different individuals, although no quantitative differences characteristic of heavy or light calculus formers as a group may be discerned. *Department of Preventive Dentistry, School of Dental and Oral Surgery, Columbia University, 630 West 168th Street, New York, New York*

Rabbit Polymorphonuclear Leukocyte Migration in Vitro in Response to Dental Plaque

Kraal, J. H. and Loesche, W. J.

J Periodont Res **9:** 1, No. 1, 1974.

A Boyden Chamber system was used to test human dental plaque extracts and whole human saliva for chemotactic activity against rabbit peritoneal polymorphonuclear leukocytes. Positive and negative controls were employed. The method was very sensitive as chemotactic responses were obtained from as little as 0.25 mg of plaque per ml of medium. Whole human saliva was less chemotactic. Most cell migration in this system resulted from a concentration gradient of dental plaque extract between the upper and lower compartments. The chemotactic factor(s) were dissolvable in water and heat stable. Samples of plaque from humans with varying degrees of periodontal involvement did not evoke statistical differences in the chemotactic response and could not be related to severity of disease. *Department of Periodontics, University of Kentucky Medical Center, Lexington, Kentucky 40506*