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The significance of maintenance care in the treatment of periodontal disease

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Abstract. The present investigation was performed to assess the efficacy of a maintenance care program to prevent recurrence of disease in patients subjected to treatment of advanced periodontitis. In addition, the periodontal status was monitored of a group of patients who following the end of active treatment were referred back to general practitioners for maintenance care. The material consisted of 90 patients who in 1972 were referred for specialist treatment of advanced periodontal disease. The patients were first subjected to an initial examination including assessment of oral hygiene, gingivitis, probing depths and attachment levels. They were on an individual basis given case presentation, instructed how to practice proper tooth-cleaning methods, their teeth were scaled and eventually the periodontal pockets were treated using the modified Widman technique. During the first 2 months following surgery the patients were recalled once every 2 weeks for professional tooth cleaning. Two months after the end of surgical treatment, the patients were reexamined to provide baseline data. Every third patient was thereafter referred back to the general dentist for maintenance care. Two out of three patients were maintained in a carefully designed and controlled maintenance care program at the university clinic. This program involved recalls once every 2–3 months and included instruction and practice in oral hygiene, meticulous scaling and professional tooth cleaning. The patients were reexamined 3 and 6 years after the baseline examination.

The results demonstrated that in patients suffering from destructive periodontitis, a treatment program that involved oral hygiene instruction, scaling, root planing and modified Widman flap procedures resulted in the establishment of clinically healthy gingiva and shallow pockets. Patients who were placed on a carefully designed recall program were over a 6-year period able to maintain excellent oral hygiene standards and unaltered attachment levels. In contrast patients who subsequent to active treatment were not maintained in a supervised program showed obvious signs of recurrent periodontitis at the follow-up examinations.

It is obvious from a number of long- and short-term studies that treatment of periodontal disease including oral hygiene instruction, scaling, root planing and surgery – in order to get access to the root surfaces for proper debridement – can not only arrest the gradual breakdown of the supporting apparatus but, indeed, also result in gain of clinical attachment and regrowth of alveolar bone (e.g. Ramfjord et al. 1973, Lindhe & Nyman 1975, Rosling et al. 1976, Polson & Heijl 1978, Knowles et al. 1979). It has also become apparent, however, that the long-term success of periodontal treatment is dependent upon the effectiveness of the maintenance care program's subsequent active treatment. Hence, in patients who following completion of surgical treatment are placed on maintenance care which includes recalls every 3 months for prophylaxis and instruction in home care techniques, the long-term result of treatment seems to be successful. On the other hand in patients who are recalled for maintenance care at a less frequent interval (6–12 months) there is an obvious risk for recurrence of periodontitis (Nyman et al. 1975, 1977).

Studies by Suomi et al. (1971), Björn (1974),

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Axelsson & Lindhe (1978), Söderholm (1979) have revealed that traditional dental treatment frequently seems to be directed towards the elimination of symptoms of caries and periodontal disease rather than on the elimination of the cause of the two disorders. Recent observations by Löe et al. (1978) and Söderholm (1979) compared to results by, e.g. Björn (1974) indicate, however, that the overall standard of oral hygiene in adult populations in Scandinavia has improved and that as a consequence the frequency and severity of caries and periodontal disease are becoming less pronounced.

Patients who suffer from advanced periodontal disease are often referred by the general practitioner to a specialist for treatment. As a rule the periodontitis patient is subjected to an elaborate treatment in the specialist's office including periodontal surgery and active maintenance care immediately postsurgically. Subsequently, in most instances, the patients are referred back to the general practitioner for long-term maintenance care. In 1978, Axelsson & Lindhe described a maintenance care program which involved prophylaxis once every 2–3 months. The plaque control program described appeared to be effective not only against the recurrence of periodontitis – in patients not subjected to periodontal surgery – but also against caries. The aim of the present investigation was to assess the efficacy of this maintenance care program in patients subjected to treatment of advanced periodontal disease including extensive surgery. The periodontal status of a group of patients who following the termination of active treatment for periodontal disease were referred back to the general practitioners for maintenance care was also monitored.

Material and Methods

The material consisted of 90 patients, 48 females and 42 males (mean age 52 years) who in 1972 were referred for specialist treatment of advanced periodontal disease.

The patients were first subjected to an *initial examination* which included assessments of oral hygiene, gingivitis and degree of periodontal tissue destruction (probing depth, attachment level). In addition, the degree of furcation involvement, when present, was recorded according to a technique described by Lindhe & Nyman (1975). The level of the alveolar bone and the configuration of the bone crest were assessed in roentgenographs obtained using a long-cone technique and with the use of a device (Eggen 1969) that ensures a reproducible geometrical relationship between the cental x-ray beam, the tooth and the film.

Presurgical treatment

Subsequent to the initial examination, the patients received, on an individual basis, detailed information about the role of dental plaque in the etiology of periodontitis. The proposed treatment plan was presented. The patients were instructed how to practice proper tooth-cleaning methods. Following motivation their teeth were carefully scaled, plaque and calculus were removed and ill-fitting margins of restorations eliminated. The presurgical treatment was delivered by one periodontist and required several sessions for each patient. Cariologic and endodontic treatment was provided when indicated. Teeth which from an endodontic, cariologic or periodontic view point could not be successfully treated were extracted. Hence, some patients were given extensive dental treatment including restorations and, in a few instances, provisional prosthetic reconstructions.

Surgical treatment

After completion of the presurgical treatment phase, the patients were subjected to periodontal surgery in all four jaw quadrants using the modified Widman technique including curettage of bony defects but no resection of bone. During the first 2 weeks subsequent to surgery, the patients were placed on a chlorhexidine mouthrinsing regimen (0.2% chlorhexidine digluconate, twice daily, 10 ml, for 2 min). In

addition, during a 2-month period the patients were recalled once every 2 weeks for professional tooth cleaning (Axelsson & Lindhe 1978). Two months after the end of the final surgical procedure, the patients were reexamined to provide baseline data (*baseline examination*) for the maintenance care program. The same parameters as those used in conjunction with the initial examination were recorded anew.

Maintenance treatment

Following the baseline examination, every third patient was sent back to the referring dentist with written information that the periodontal lesions had been treated and that in order to maintain periodontal health the oral hygiene, calculus formation, gingival conditions and probing depths had to be checked regularly. The need to follow a detailed plaque control program was also emphasized (*Non-recall group*). Two out of every three patients were maintained at the university clinic in a carefully designed and controlled maintenance care program (*Recall group*). This program involved recalls once every 2 months during the first 2 years and subsequently, i.e. during the last 4 years of observation, once every 3 months. Each recall visit included 1) instruction and practice in oral hygiene techniques, (2) meticulous scaling, and (3) professional tooth cleaning.

The prophylactic sessions were handled by a dental hygienist and required about 30 min. During such a session, the dental plaque was stained with a disclosing solution and the Bass method of tooth brushing demonstrated. The patients were instructed in the use of dental floss and toothpicks for interdental plaque control. Supra- and subgingivally located deposits were removed and, if needed, the root surfaces planed.

All patients were reexamined at *follow-up examinations* 3 and 6 years after the baseline examination. At the *follow-up examinations* the parameters studied at the *initial and baseline examinations* were recorded anew.

During the maintenance period of 6 years, eight persons in the recall group were lost (one died and seven moved from the area). In the non-recall group five patients were lost (one died and four moved from the area). Hence the data reported in this study involve 52 recall and 25 non-recall patients.

At the initial, baseline and follow-up examinations (3 and 6 years), the following parameters were studied.

Oral hygiene status. The teeth were stained with a disclosing solution. The presence or absence of continuous plaque in the cervical portion of the buccal, lingual and proximal surfaces of each tooth in the dentition was determined. For each individual, the percentage of tooth surfaces with plaque was calculated.

Gingivitis. The presence or absence of gingivitis (bleeding on probing) in four gingival units around each tooth was assessed following probing. The percentage of inflamed gingival units in relation to the total number of gingival units present was assessed.

Probing depth. The depths of the periodontal pockets were measured with a flat, graduated periodontal probe (Hu-Friedy® probe) on four surfaces around each tooth. On the mesial and distal surfaces, the pockets were measured from the mesio-buccal (disto-buccal), and mesio-lingual (disto-lingual) line angles. Of the two measurements made on the mesial/distal surfaces only the largest value was recorded. The pockets on the buccal tooth surfaces of upper and lower molars were recorded at the most buccal aspect of the mesial root. In the lower molar region the lingual pockets were recorded at the lingual aspect of the mesial root.

Attachment levels. The largest distance between the cemento-enamel junction and the bottom of the clinical pocket was assessed at all buccal, lingual and mesial tooth surfaces according to a technique described by Ramfjord et al. (1973). The attachment level assessments were made

with the same graduated probe as the one used for scoring probing depths and the measurements were made at the same location points.

Probing depths as well as attachment level measurements were adjusted to the nearest mm.

Sources of error. All measurements were made by one of the authors (P.A.). The errors inherent in the various assessments were determined in a manner described by Rosling et al. (1976). For details regarding the evaluation of the assessment errors, see Rosling et al. (1976).

Statistical analysis. The statistical analysis was based on Mann-Whitney-Wilcoxon two-sample test, corrected for ties when needed.

Results

The results from the initial examination are presented in Table 1. The average number of teeth in the recall and non-recall patients were 21.2 (±6.3) and 20.6 (±4.4). Most of the tooth surfaces examined harbored dental plaque (78–83%) and seven to eight gingival units out of 10 examined were bleeding on gentle probing (71–78%). The individual mean probing depths were 4.3 (±0.6) and 4.2 (±1.0) mm.

Tooth mortality

During the period of active treatment a number of teeth had to be extracted. Therefore the number of teeth present at the baseline examination was smaller than that recorded at the initial examination (Table 2). The loss of teeth in the recall group was on average 1.6 and in the

Table 2. Number of teeth ($\bar{X}$, s.d.) present at initial and baseline examinations
Anzahl Zähne ($\bar{X}$, s.d.) bei der Initial- und Ausgangsuntersuchung
Nombre de dents (moyenne $=\bar{X}$ et écart-type=s.d.) présentes aux examens initial et de référence (baseline)

Groups	Examinations	
	Initial	Baseline
Recall	21.2	19.6
	6.27	7.02
Non-recall	20.6	18.0
	4.38	5.05

Table 1. Data describing the results of the initial examination. Total=individual mean values
Daten, die die Resultate der initialen Untersuchung beschreiben. Total=individuelle Mittelwerte
Résultats de l'examen initial. Total=valeurs moyennes individuelles

Groups				
		No. of teeth ($\bar{X}$, s.d.)		
Recall		21.2±6.3		
Non-recall		20.6±4.4		
		Plaque % ($\bar{X}$, s.d.)		
	Proximal	Buccal	Lingual	Total
Recall	97±11.5	53±22.2	84±16.9	83±11.3
Non-recall	99±10.8	42±17.4	73±17.1	78± 7.9
		Gingivitis% ($\bar{X}$, s.d.)		
	Interproximal	Buccal	Lingual	Total
Recall	99±2.7	45±22.6	74±21.4	78±11.7
Non-recall	95±8.0	32±17.3	61±19.7	71±10.6
		Probing depth mm ($\bar{X}$, s.d.)		
	Interproximal	Buccal	Lingual	Total
Recall	5.3±0.8	3.0±0.7	3.5±0.7	4.3±0.6
Non-recall	5.2±1.2	2.9±0.9	3.6±1.0	4.2±1.0

Table 3. Number of molars, premolars+canines and incisors present at the baseline and the follow-up examination after 6 years ($\bar{X}$, s.d.)

Anzahl Molaren, Prämolaren+Eckzähne und Schneidezähne, die bei der Ausgangs- und Nachuntersuchung nach 6 Jahren vorhanden waren ($\bar{X}$m s.d.)

Nombre de molaires, de prémolaires+canines et d'incisives présentes aux examens de référence et du rappel de 6 ans (moyenne et écart-type)

Groups		Molars	Premolars+ Canines	Incisors	Total No. of Teeth
Recall	Baseline	3.5	9.4	6.6	19.6
		2.55	2.90	2.30	7.02
	6 years	3.5	9.4	6.5	19.4
		2.55	2.90	2.30	7.02
Non-recall	Baseline	2.6	9.0	6.4	18.0
		2.02	1.95	2.20	5.05
	6 years	2.4	8.8	6.0	17.3
		2.04	2.14	2.35	5.48

non-recall group 2.6 teeth. The difference in tooth loss between the two groups during the period of active treatment was not statistically significant.

Table 3 shows the number of different types of teeth present at the baseline and follow-up examinations after 6 years. In both categories of patients the loss of teeth during the 6 years of observation was small; the number of remaining teeth was 19.6–19.4 (recall group) and 18.0–17.3 (non-recall group). The difference between the two groups of patients regarding tooth mortality during the maintenance period was statistically insignificant.

Table 4. Plaque. Frequency distribution of surfaces (%) harboring plaque ($\bar{X}$, s.d.). P=proximal, B=buccal, L=lingual, T=total=individual mean scores

Plaque. Häufigkeitsverteilung der Oberflächen (in%) mit adhärierender Plaque ($\bar{X}$, s.d.). P=*approximal, B=bukkal,* L=lingual, T=*total=individuelle Mittelwerte der "scores" (Bewertungseinheiten)*

Plaque. Distribution de fréquence des faces (%) où la plaque était présente (moyenne; écart-type). P=proximales, B=vestibulaires, L=linguales, T=total=scores moyens individuels

Groups	Recall				Non-recall			
Examinations	P	B	L	T	P	B	L	T
Initial	97	53[2)]	84	83	99	42	73	78
	11.5	22.2	16.9	11.3	10.8	17.4	17.1	7.9
Baseline	30	5	21[2)]	21	34	3	11[2)]	20
	20.5	5.9	14.6	14.6	13.2	4.4	6.4	6.8
Follow-up								
3 years	29[3)]	5[3)]	11[3)]	18[3)]	83[3)]	17[3)]	42[3)]	56[3)]
	19.9	13.3	19.1	16.6	19.3	12.0	22.9	16.7
6 years	25[3)]	6[3)]	8[3)]	16[3)]	90[3)]	28[3)]	56[3)]	66[3)]
	20.6	8.7	10.8	10.7	13.6	23.3	28.7	14.9

In Tables 4–8 statistically significant differences between recall and non-recall groups have been identified in the following manner:

1) $P<0.05$
2) $P<0.01$
3) $P<0.001$

Oral hygiene

The oral hygiene conditions are presented in Table 4 and Fig. 1. Between the initial examination and the baseline examination there was in all patients a marked improvement of the oral hygiene status. The individual mean plaque scores were reduced from 83 to 21% (recall group) and from 78 to 20% (non-recall group). At the follow-up examinations 3 and 6 years later, the recall group patients had maintained excellent oral hygiene levels (18 and 16%), whereas the non-recall group patients showed recurrence of large numbers of plaque-carrying tooth surfaces (56 and 66%).

Gingival conditions

Active treatment resulted in both groups of patients in a marked reduction of the frequency distribution of bleeding gingival units. Hence, at the baseline examination only 7% (recall group) and 4% (non-recall group) of the gingival units were bleeding on probing (Table 5, Fig. 1). At the follow-up examinations the recall group patients had maintained very low gingivitis scores (2%) whereas the non-recall patients showed recurrence of gingivitis: 37% bleeding units after 3 years and 55% after 6 years.

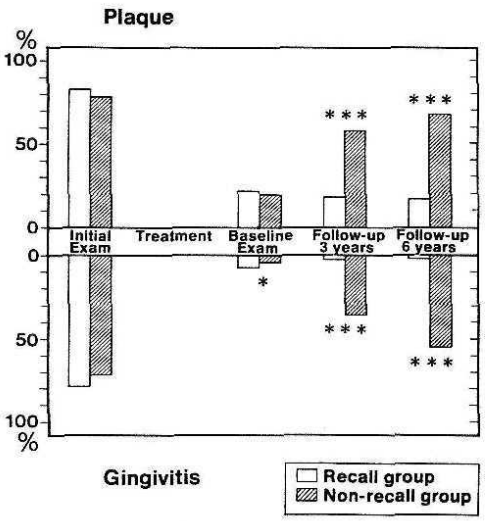

Fig. 1. Histograms describing the frequency distribution of tooth surfaces with plaque and inflamed gingival units in the two groups of patients at the initial, baseline and follow-up examinations 3 and 6 years after the baseline.

Das Histogramm beschreibt die Verteilung der Oberflächen mit adhärierender Plaque und entzündeten gingivalen Einheiten in zwei Patientengruppen, bei der initialen Untersuchung, der Ausgangsuntersuchung (baseline) und den Nachuntersuchungen 3 und 6 Jahre nach der Ausgangsuntersuchung.

Histogramme représentant la distribution de fréquence des faces dentaires avec plaque et des localisations gingivales enflammées dans les deux groupes de patients, à l'examen initial, à l'examen de référence (baseline) et aux examens de rappel 3 ans et 6 ans après l'examen de référence.

* Significant difference $P<0.05$

*** Significant difference $P<0.001$.

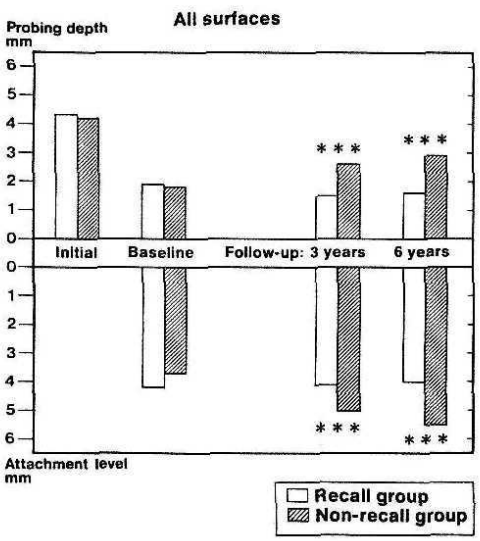

Fig. 2. Individual mean pocket (probing) depth and attachment level data from the initial, baseline and follow-up examinations after 3 and 6 years.

Individuelle Mittelwerte der Taschen-(Sondierungs-) tiefen und der Daten über das Attachmentniveau der initialen, der Ausgangs- und der Nachuntersuchungen nach 3 und 6 Jahren.

Moyenne individuelle de la profondeur des poches au sondage (probing depth) et du niveau de l'attachement (attachment level) à l'examen initial, à l'examen de référence et aux examens de rappel 3 ans et 6 ans plus tard.

*** Significant difference $P<0.001$

Table 5. Gingivitis. Frequency distribution of units (%) which were bleeding on gentle probing ($\bar{X}$, s.d.). P=interproximal, B=buccal, L=lingual, T=total=individual mean scores

Gingivitis. Häufigkeitsverteilung der Einheiten (in%), die bei leichtem Sondieren bluteten. ($\bar{X}$, s.d.). P=approximal, B=bukkal, L=lingual, T=total=individuelle Mittelwerte der "scores"

Gingivite. Distribution de fréquence des localisations (%) où il se produisait un saignement lors du sondage prudent de la poche (moyenne; écart-type). P=proximales, B=vestibulaires, L=linguales, T=total=scores moyens individuels

Groups	Recall				Non-recall			
Examinations	P	B	L	T	P	B	L	T
Initial	99	45[1)]	74[2)]	78[2)]	95	32[1)]	61[2)]	71[2)]
	2.7	22.6	21.4	11.7	8.0	17.3	19.7	10.6
Baseline	10	1	5[1)]	7[1)]	10	1	2[1)]	4[1)]
	8.0	2.4	7.5	4.8	7.1	1.8	3.1	2.7
Follow-up								
3 years	2[3)]	0[3)]	2[3)]	2[3)]	57[3)]	8[3)]	25[3)]	37[3)]
	6.4	1.4	4.0	3.7	27.8	10.5	15.1	17.7
6 years	3[3)]	1[3)]	1[3)]	2[3)]	76[3)]	26[3)]	41[3)]	55[3)]
	6.4	2.0	4.5	4.0	26.1	36.9	29.9	23.0

Probing depths and attachment levels

The average probing depths (Fig. 2, Table 6) were in both groups reduced from the initial to the baseline examinations from 4.3 (±0.66) to 1.9 mm (±0.32) and 4.2 (±0.99) to 1.8 (±0.24 mm). The probing depths were consistently larger on approximal surfaces than on buccal or lingual surfaces (Table 6, Fig. 3). The maintenance program delivered to the recall group patients made it possible for these patients to maintain shallow pockets over the 6 years of study (Figs. 2, 3, Table 6). In the non-recall patients, however, deeper pockets gradually showed a tendency to recur. Hence, after 3 and 6 years the average individual mean probing depths were 2.6 (±0.38) and 2.9 (±0.51) mm (Table 6). These figures should be compared both with the baseline data (1.8 mm) and with the corresponding figures for the recall group (1.5 mm/3 years; 1.6 mm/6 years).

Table 6. Probing depth (mm, $\bar{X}$, s.d.). P=interproximal, B=buccal, L=lingual, T=total=individual mean values

Sondierungstiefe (mm, $\bar{X}$, s.d.) P=approximal, B=bukkal, L=lingual, T=total=individuelle Mittelwerte

Profondeur de sondage (mm, moyenne, écart-type). P=proximales, B=vestibulaires, L=linguales, T=total=valeurs moyennes individuelles

Groups	Recall				Non-recall			
Examinations	P	B	L	T	P	B	L	T
Initial	5.3	3.0	3.5	4.3	5.2	2.9	3.6	4.2
	0.79	0.67	0.70	0.66	1.21	0.85	0.99	0.99
Baseline	2.3	1.5	1.6	1.9	2.1	1.3	1.4	1.8
	0.36	0.33	0.40	0.32	0.26	0.33	0.29	0.24
Follow-up								
3 years	1.7[3)]	1.2[3)]	1.3[3)]	1.5[3)]	3.0[3)]	2.2[3)]	2.2[3)]	2.6[3)]
	0.46	0.27	0.32	0.35	0.44	0.35	0.39	0.38
6 years	1.9[3)]	1.4[3)]	1.4[3)]	1.6[3)]	3.4[3)]	2.4[3)]	2.6[3)]	2.9[3)]
	0.44	0.33	0.33	0.35	0.60	0.34	0.50	0.51

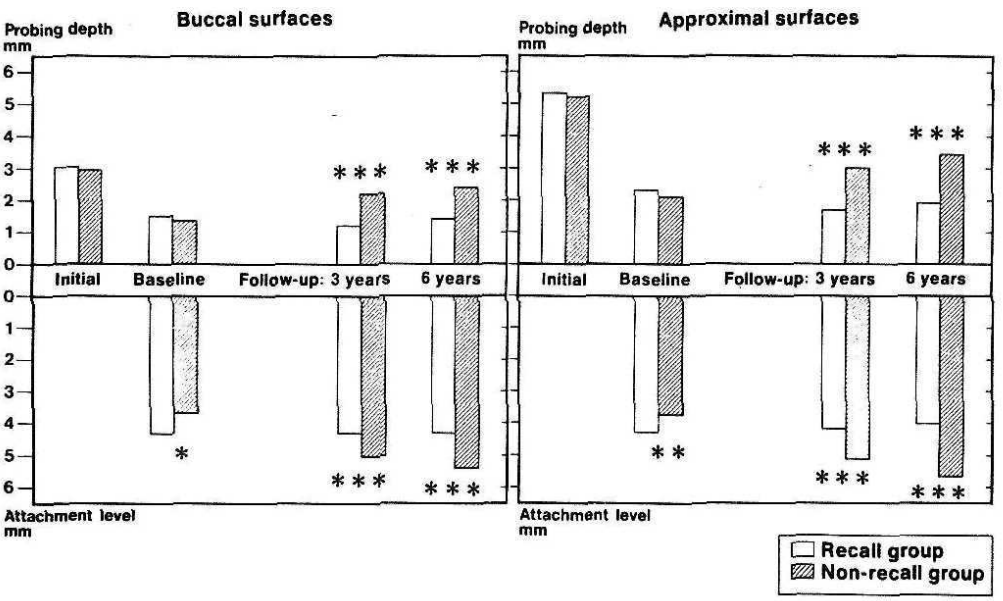

Fig. 3. Pocket (probing) depth and attachment level data from buccal and approximal surfaces obtained at the initial, baseline and follow-up examinations.

Taschen-(Sondierungs-)tiefen und Attachmentniveaudaten der bukkalen und approximalen Oberflächen, erhalten bei der initialen, der Ausgangs- und den Nachuntersuchungen.

Profondeur des poches au sondage (probing depth) et niveau de l'attachement (attachment level) au niveau des faces vestibulaires (buccal) et proximales (approximal) aux examens initial, de référence et de rappel.

* Significant difference $P<0.05$
** Significant difference $P<0.01$
*** Significant difference $P<0.001$.

Table 7 presents the frequency distribution of different categories of probing depths; ≤3 mm, 4–6 mm and ≥7 mm. At the initial examination a large number of pockets were >3 mm deep (recall group=66%, non-recall group=50%). At the baseline examination only isolated pockets could be identified which were >3 mm. At the follow-up examinations there were in the recall group practically no pockets>3 mm. In the non-recall group, however, 9% (3 years) and 20% (6 years) of the pockets examined were >3 mm. The majority of the deep pockets were found on approximal surfaces.

Table 8 demonstrates the effect of active treatment and maintenance care on the attachment levels. The recall group patients were able to maintain their attachment levels unaltered between the baseline and 6-year follow-up examinations. The non-recall group patients, however, lost on the average 1.8 mm of attachment over the 6 years of observation (Figs. 2, 3). The attachment loss was most pronounced at approximal surfaces (Fig. 3). Table 9 shows the attachment alterations between the baseline and 6-year follow-up examinations. It is obvious that only isolated surfaces in the recall group patients lost attachment whereas more than half of the surfaces examined in the non-recall group lost between 2–5 mm of attachment. The attachment loss was most pronounced in the molar tooth regions.

Discussion

The present investigation demonstrated that in patients suffering from destructive periodon-

Table 7. Probing depth. Frequency distribution ($\bar{X}$, s.d.) of probing depths ≤ 3 mm, 4–6 mm, ≥ 7 mm. P=interproximal, B=buccal, L=lingual, T=total=individual mean values

Sondierungstiefe. Häufigkeitsverteilung ($\bar{X}$, s.d.) der Sondierungstiefen ≤ 3 mm, 4–6 mm, ≥ 7 mm. P=approximal, B=bukkal, L=lingual, T=total=individuelle Mittelwerte

Profondeur de sondage. Distribution de fréquence (moyenne; écart-type) des profondeurs de sondage ≤ 3 mm, 4–6 mm, ≥ 7 mm. P=proximales, B=vestibulaires, L=linguales, T=total=valeurs moyennes individuelles

Groups / Examinations		Recall P	B	L	T	Non-recall P	B	L	T
Initial	mm								
	≤3	6	81	57	35[2)] 15.2	29	83	67	50[2)] 16.9
	4–6	83	19	42	58[3)] 13.2	50	16	30	38[3)] 10.9
	≥7	12	0	1	8 9.4	21	2	3	12 12.3
Baseline	≤3	99	100	99	99 –	99	100	100	99 –
	4–6	1	0	1	1 –	2	0	0	1 –
	≥7	0	0	0	0 –	0	0	0	0 –
Follow-up 3 years	≤3	99	100	100	99[3)] –	84	98	97	91[3)] 6.3
	4–6	1	0	0	1[3)] –	16	2	3	9[3)] 6.4
	≥7	0	0	0	0 –	0	0	0	0 –
Follow-up 6 years	≤3	99	100	100	99[3)] –	68	95	88	80[3)] 13.3
	4–6	1	0	0	1[3)] –	30	4	11	19[3)] 13.3
	≥7	0	0	0	0[3)] –	2	0	1	1[3)] –

Table 8. Attachment level (mm, $\bar{X}$, s.d.). P=interproximal, B=buccal, L=lingual, T=total (individual mean) values

Attachmentniveau (mm, $\bar{X}$, s.d.). P=approximal, B=bukkal, L=lingual, T=total (individuelle Mittelwerte)

Niveau de l'attachement (mm, $\bar{X}$, s.d.). P=proximal, B=vestibulaire, L=lingual, T=valeurs totales (moyenne individuelle)

Groups / Examinations	Recall P	B	L	T	Non-recall P	B	L	T
Baseline	4.3[2)] 0.99	4.3[1)] 1.10	3.9 0.87	4.2[1)] 0.90	3.7[2)] 1.30	3.7[1)] 0.95	3.7 1.26	3.7[1)] 1.11
Follow-up								
3 years	4.2[3)] 0.98	4.3[3)] 1.01	3.8[3)] 0.86	4.1[3)] 0.88	5.1[3)] 0.85	5.0[3)] 0.86	5.8[3)] 0.89	5.0[3)] 0.86
6 years	4.0[3)] 1.02	4.3[3)] 1.07	3.7[3)] 0.88	4.0[3)] 0.93	5.7[3)] 1.22	5.4[3)] 1.10	5.3[3)] 1.13	5.5[3)] 1.13

Table 9. Loss of attachment between the baseline and 6-year follow-up examinations. Frequency distribution (%) of surfaces. Mol.=Molars, Premol.=Premolars, Inc.=Incisors, Tot.=total=individual mean values. M=mesial, B=buccal, L=lingual

Attachmentverlust zwischen der Ausgangs- und den Nachuntersuchungen nach 6 Jahren. Häufigkeitsverteilung (in%) der Oberflächen. Mol.=Molaren, Premol.=Prämolaren, Inc.=Schneidezähne, Tot.=total=individuelle Mittelwerte. M=mesial, B=bukkal, L=lingual

Perte de l'attachement survenue entre l'examen de référence (baseline) et l'examen du rappel (follow-up) de 6 ans. Distribution de fréquence (%) des faces. Mol.=molaires, Premol.=prémolaires, Inc.=incisives, Tot.=total=valeurs moyennes individuelles. M=mésiales, B=vestibulaires, L=linguales

		Recall				Non-recall			
		Mol.	Premol.+ Canines	Inc.	Tot.	Mol.	Premol.+ Canines	Inc.	Tot.
≤1mm	M	99	100	99	99	34	43	32	36
					3.0				18.6
	B	98	98	98	98	36	49	51	48
					3.9				19.6
	L	100	99	100	99	33	54	53	49
					1.7				19.1
	Tot.	99	99	99	99	34	49	45	44
					2.1				15.5
2–5 mm	M	1	0	1	1	62	56	68	63
									18.5
	B	2	2	2	2	64	51	49	52
									18.7
	L	0	1	0	1	64	46	47	50
									18.8
	Tot.	1	1	1	1	63	51	55	55
									14.7
≥6 mm	M					3	1	0	1
	B					0	1	0	1
	L					3	0	0	1
	Tot.					2	1	0	1

titis, a treatment program that involved oral hygiene instruction, scaling, root planing and modified Widman flap procedures, resulted in the establishment of clinically healthy gingivae and shallow periodontal pockets. It was also demonstrated that patients who after a baseline examination carried out at the end of the active treatment phase, i.e. 2 months after surgery, were placed on a carefully designed recall program involving prophylaxis once every 2–3 months during a 6-year period were able to maintain (1) excellent oral hygiene standards, (2) healthy gingivae, (3) shallow periodontal pockets and (4) unaltered attachment levels. In addition the patients within the recall group did not, during the 6 years, suffer from tooth loss. In contrast, patients who subsequent to the baseline examination were not maintained in a similar carefully supervised program showed after 3 and 6 years obvious signs of recurrent periodontitis including frank gingivitis, increasing frequency of deepened pockets, further loss of attachment, and some tooth loss.

In all respects the findings made in the present trial confirm data reported by, e.g. Ramfjord et al. (1973), Lindhe & Nyman (1975), Rosling et al. (1976), Polson & Heijl (1978), Knowles et al. (1979), Nyman & Lindhe (1979). They demonstrated that patients who subsequent to the end of active treatment of periodontal disease were placed on a maintenance program involving regularly repeated prophyl-

axis did not experience recurrence of disease. Our findings also support data presented by Suomi et al. (1971), Nyman et al. (1977) and Axelsson & Lindhe (1978) by showing that patients who are not properly maintained subsequent to active periodontal therapy frequently develop recurrent periodontitis. Furthermore, the observations made in the non-recall group patients at the reexaminations 3 and 6 years following active treatment demonstrate that traditional dental care rarely includes proper plaque control measures. Hence, it seems justified to emphasize the responsibility of the specialist, the periodontist, not only for the active treatment and design of the maintenance care program but also for the delivery of regularly repeated prophylaxis.

Tables 6–9 and Figs. 2 and 3 describe the alterations in probing depths and attachment levels from the initial, baseline and follow-up examinations. The data from the initial examination (Tables 6,7) show that in the recall as well as in the non-recall group patients the probing depths at the buccal tooth surfaces were significantly smaller than on the proximal and lingual surfaces. Also following surgical treatment the average probing depths at the buccal tooth surfaces remained smaller than at the interproximal surfaces (Table 6). It is interesting to note (Table 7) that only 1% of all surfaces examined in the recall group at the follow-up examinations had periodontal pockets with probing depths >3 mm. All pockets measured on buccal/lingual surfaces were <3 mm. The corresponding attachment loss figures are reported in Tables 8 and 9. It is obvious from these figures that only in rare situations did attachment loss occur in the recall group between the baseline and the follow-up examinations after 6 years. When attachment changes occurred in this group of patients, the buccal surfaces showed a higher frequency of loss than mesial and lingual surfaces. Hence, whereas most gain in clinical attachment (Table

Table 10. Alterations (±) of attachment levels between the baseline and 6-year follow-up examinations. Frequency distribution ($\bar{X}$, s.d.); see also Table 9

Änderungen (±) der Attachmentniveaus zwischen der Ausgangsuntersuchung und den Nachuntersuchungen nach 6 Jahren. Häufigkeitsverteilung ($\bar{X}$, s.d.); siehe auch Table 9

Modifications (±) du niveau de l'attachement entre l'examen de référence (baseline) et l'examen du rappel de 6 ans. Distribution de fréquence (moyenne; écart-type); voir aussi tableau 9

		Recall				Non-recall			
		Mol.	Premol.+ Canines	Inc.	Tot.	Mol.	Premol.+ Canines	Inc.	Tot.
+ (≥1mm)	M	27	32	23	28 22.2	0	1	2	1
	B	14	11	11	11 14.4	0	1	3	1
	L	11	14	9	12 12.3	2	0	3	1
	Tot.	17	19	14	17 14.1	1	1	3	1
− (≥1 mm)	M	5	5	6	5 7.0	30	29	24	26 11.7
	B	16	18	19	19 14.4	26	39	38	37 14.5
	L	4	6	9	7 9.5	26	43	37	37 18.6
	Tot.	9	9	12	10 7.3	27	37	33	34 11.5

10) occurred at interproximal surfaces (28%), attachment loss, when occurring, was most obvious on buccal tooth surfaces (19%). In all respects these findings are in agreement with Ramfjord et al. (1973). They reported that some loss of attachment occurred at buccal tooth surfaces subsequent to periodontal surgery also in well-maintained patients.

It is obvious that the average figures describing attachment level alterations only poorly illustrate the true alterations of the attachment over the 6 years of observation. For instance, if the data for the recall group patients, described in Tables 8, 9 and 10 are compared, it can be seen that the individual mean figures (Table 8) describe a gain in attachment amounting to 0.2 mm over the 6 years. In fact, 17% of all surfaces examined showed a gain in attachment ($\geq$1 mm), 10% showed a loss of attachment ($\geq$1 mm) whereas around 70% of the surfaces showed no signs of attachment level alterations during the observation period. In the non-recall group there was a marked loss of attachment (Table 8) between the baseline and the 6-year follow-up examination. During the first 3 years after active treatment on the average 1.3 mm of attachment was lost, whereas during the second 3-year period an additional 0.5 mm was lost. Also for the non-recall group patients the attachment loss figures become more meaningful if the frequency distribution of degree of loss is presented rather than the average figures. Thus, from Table 9 it can be seen that whereas 44% of all surfaces lost 1 mm or less as many as 55% of all surfaces lost between 2–5 mm, 1% of the surfaces lost more than 6 mm of attachment. Attachment loss tended to be somewhat more frequent at the mesial than at the buccal and lingual surfaces. Even if limited information has been published regarding the natural loss of periodontal tissue support in an adult population (Axelsson & Lindhe 1978, Löe et al. 1978, Becker et al. 1979, Söderholm 1979), the attachment loss in the present non-recall material was pronounced and similar to that reported by Nyman et al. (1977) in a 2-year study on the effect of periodontal surgery in plaque-infected dentitions.

Zusammenfassung

Die Bedeutung der Nachsorge bei der Behandlung der Parodontalkrankheit

Die vorliegende Untersuchung wurde durchgeführt um die Effizienz eines Nachsorgeprogrammes zu prüfen das zur Aufgabe hat, Krankheitsrezidive bei Patienten mit fortgeschrittener Parodontitis zu verhindern. Weiterhin wurde der Parodontalstatus einer Gruppe Patienten aufgenommen, die nach Abschluss der aktiven Behandlung ihrem Privatzahnartz zur Nachsorge überwiesen wurden. Das Material bestand aus 90 Patienten, die im Jahre 1972 dem Spezialisten überwiesen worden waren. Eine initiale Untersuchung wurde vorgenommen, die aus der Beurteilung des oralen Hygieneniveaus, Registrierung vorliegender Gingivitis, der Messung der Sondierungstiefen und der Attachmentniveaus bestand. Die Patienten wurden mit ihrer Situation bekannt gemacht (case presentation) und instruiert, wie zweckmässige Zahnreinigungsmethoden durchzuführen seien. Der Zahnstein wurde entfernt und eventuell wurden die parodontalen Taschen mit der modifizierten Widman-Technik behandelt. Während der ersten zwei Monate nach der Parodontalchirurgie wurden die Patienten einmal wöchentlich zur professionellen Zahnreinigung einbestellt. Zwei Monate nach dem Abschluss der chirurgischen Behandlung wurden die Patienten erneut untersucht um Daten für eine Ausgangsuntersuchung (baseline) festzulegen. Jeder dritte Patient wurde darauf zur Nachsorge an seinen Privatzahnarzt überwiesen. Zwei von drei Patienten erhielten sorgfältig programmierte Nachsorgebehandlung an der Universitätsklinik. Dieses Programm bedeutete eine Einbestellung in Abständen von 2–3 Monaten und beinhaltete Instruktion und praktische Übungen in oralen Hygienemassnahmen, sorgfältige Zahnsteinentfernung und professionelle Zahnreinigung. 3 und 6 Jahre nach der Ausgangsuntersuchung wurden die Patienten nachuntersucht. Die Resultate dieser Studie zeigten, dass bei Patienten mit destruktiver Parodontitis ein Behandlungsprogramm mit oraler Hygieneinstruktion, Zahnsteinentfernung, Wurzelglättung und modifizierter Lappenoperation nach Widman, klinisch gesunde Gingiva und flache Zahnfleischtaschen erreichen konnte. Patienten, die an einem sorgfältig geplanten Nachsorgeprogramm teilnahmen, konnten während eines Zeitabschnittes von 6 Jahren einen ausgezeichneten oralen Hygienestatus und unverändertes Attachmentniveau aufrechterhalten. Im Gegensatz dazu wurden bei den Patienten, die nach der aktiven Behandlung nicht an einem überwachten Nachsorgeprogramm teilnehmen konnten,

bei den Nachuntersuchungen Zeichen rezidivierender Parodontitis festgestellt.

Résumé

L'importance des soins de maintien dans le traitement des affections parodontales

La présente étude a été effectuée dans le but d'évaluer l'efficacité d'un programme de soins de maintien destinés à prévenir les récidives chez des patients ayant subi le traitement d'une parodontite à un stade avancé. On a de plus surveillé l'état du parodonte chez un groupe de patients qui, après la fin du traitement actif, avaient été renvoyés à leur praticien pour les soins de maintien. L'ensemble consistait en 90 patients, adressés par leur praticien pour traitement spécialisé d'une affection parodontale à un stade avancé. Les patients ont d'abord subi un examen initial comprenant l'enregistrement de l'hygiène buccale, de la gingivite, de la profondeur de sondage et du niveau de l'attachement. Ils ont reçu individuellement des renseignement sur leur cas, des instructions sur la manière de pratiquer le nettoyage habituel suivant des méthodes adéquates, les dents ont été détartrées, enfin les culs-de-sac ont été traités par la méthode de Widman modifiée. Pendant les deux premiers mois suivant chaque opération, les patients ont été convoqués tous les quinze jours pour un nettoyage dentaire professionnel. Deux mois après la fin du traitement chirurgical, les patients ont de nouveau été examinés pour l'enregistrement des données devant servir de référence (baseline). Un patient sur trois a ensuite été renvoyé à son praticien pour les soins de maintien. Deux patients sur trois ont été maintenu en traitement dans les services de l'université et y ont subi les soins de maintien suivant un programme dirigé conçu spécialement. Ce programme était basé sur des rappels tous les 2–3 mois et comprenait l'enseignement et l'entraînement des soins personnels d'hygiène bucco-dentaire et l'exécution de nettoyages dentaires professionnels minutieux. Les patients ont de nouveau été examinés 3 ans et 6 ans après l'examen de référence.

Les résultats ont mis en évidence que, chez des patients atteints de parodontite destructrice, un programme de traitement comportant les instructions en matière d'hygiène bucco-dentaire, des détartrages, polissages radiculaires et opérations à lambeau suivant la technique de Widman modifiée permettait d'obtenir des gencives cliniquement saines et des poches peu profondes. Les patients qui ont participé à un programme de rappels spécialement conçu (groupe recall) ont été capable de maintenir sur une période de 6 ans une hygiène bucco-dentaire très satisfaisante, et les niveaux de l'attachement restaient chez eux inchangés. Par contre, les patients qui, après le traitement actif, n'étaient pas soumis à un programme surveillé (groupe non-recall), présentaient aux examens de rappels des signes manifestes de récidive des parodontites.

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