CHAPTER 10.   SUPPORTIVE PERIODONTAL THERAPY

DEFINITION

Supportive Periodontal Treatment (Periodontal Maintenance, Preventive Maintenance, Recall Maintenance): An extension of periodontal therapy. Procedures performed at selected intervals to assist the periodontal patient in maintaining oral health. These usually consist of examination, an evaluation of oral hygiene and nutrition, scaling, root curettage, and polishing of teeth.

TOOTH MORBIDITY/INCIDENCE

Pelton et al. (1954) evaluated tooth morbidity experience in adults. Data were obtained from the analysis of nearly 225,000 dental examinations of U.S. Public Health Service beneficiaries over a 5-year period. Of a possible 32 teeth with an average age of 41 years, 19.1 or 60% were decayed, missing, or filled (DMF). DMF increase with age, with missing teeth contributing the greatest weight to the total morbidity index after the age of 33. The number of decayed teeth and filled teeth increases with age and the number of unaffected teeth remaining in the mouth decreases. The number of teeth indicated for extraction increases with age, and the number requiring fillings decreases with age. This study reveals a DMF rate increases about 0.25 of a tooth per year over 50 years of an adult life. The component of the DMF rate due to missing teeth increases at 0.4 teeth per year. Patients under 35, primarily lost teeth due to caries, those above that age had periodontal disease as the controlling factor.

NATURAL HISTORY

In 1978A, Löe et al. published the initial observations in a longitudinal study on the initiation and progression of periodontal disease in man. The study design consisted of 1 group of 565 Norwegian students and academicians and another group of 480 Sri Lankan tea laborers. The periodontal state of the Norwegian group had good to excellent oral hygiene and mild gingivitis. Supra- and subgingival calculus was inconspicuous and untreated gingival caries rare. Slight attachment loss was seen in the youngest group and increased slowly with age, with a calculated rate of attachment loss of 0.05 mm per year during the 20s. The mean at 30+ year old was less than 1 mm. The Sri Lankan group showed poor oral hygiene, abundance of calculus, and generalized moderate to severe gingivitis. Caries and dental restorations were non-existent. Attachment loss was evident in the 15-year-olds and increased through the 20s. At 30+ years of age the tea laborers showed a mean loss of more than 3 mm and a great number in excess of 10

mm. A rate of attachment loss was calculated to be approximately 0.20 mm per year. The results of this investigation show that all stages of periodontal health and disease are present in these 2 populations.

In a second report, Löe et al. (1978B) discussed tooth mortality rates before 40 years of age by comparing the two populations. Both populations were examined 4 times during the study, a period of 6.25 years for the Norwegians and 7.5 years for the Sri Lankans. The 17-year-old Norwegians had 27.4 teeth with no major loss of teeth occurring during their 20s and 30s. As they approached 40, the mean number of teeth present was 27.1 and the mean mortality rate was 0.01 teeth per year. Sri Lankan 15-year-olds had 27 teeth present and the 40-year-olds had 25.6 teeth. The mean mortality rate ranged between 0.1 and 0.3 teeth per year.

A third report (Anerud et al., 1979) reviewed overall changes in gingival health and oral hygiene before 40 years of age. The overall gingival state of the 17-year-old Norwegians was good to excellent, with no significant increase of gingivitis to approximately 40 years of age. The 17-year-old Sri Lankans' gingival health was considerably poorer, with slight increases in GI levels occurring to age 40. In the Norwegians, 60 to 70% of all tooth surfaces had no visible plaque and oral hygiene continued to improve toward age 40. The Sri Lankans had clinically visible plaque covering almost all tooth surfaces at 15 years old, with no significant change occurring before 40.

UNTREATED DISEASE

Becker et al. (1979) examined 30 patients diagnosed with moderate to advanced periodontal disease, but who were not treated periodontally. The time interval between examinations ranged from 1.5 years to 9 years, 7 months (mean = 3.72 years). A total of 83 teeth were lost (10.6%), but a patient who lost 25 teeth was excluded, resulting in 58 teeth lost (7.7%), or 0.61 teeth per patient per year. Mandibular first and second molars were most frequently lost, followed by maxillary molars. Mandibular canines and incisors were most resistant loss. Teeth that were lost had deeper probing depths (PD) and greater mobility that other teeth, with greater PD at disto-lingual and mesio-lingual surfaces. An inverse relationship was observed between PD increase and patient age. The rate was slower for patients > 44 years compared to younger patients. All patients had radiographic evidence of progressive bone loss.

Lindhe et al. (1983) studied 64 Swedish subjects with mild to moderate periodontal disease, monitoring attach-

ment levels over a 6-year period during which no periodontal therapy was received. Comparisons were made with 36 Americans who had a more advanced destructive periodontal condition and were observed at 1 year. At 3 and 6 years for the Swedish subjects, 1.6% of sites showed attachment loss of more than 2 mm, 57.4% of sites had no change and 0.5% of sites showed more than 2 mm of attachment "gain." Approximately 50% of sites that showed no change in the first 3 years, showed loss in the next 3 years. Attachment loss between the baseline and 3 and 6 years averaged ~ 0.2 mm per year. Of sites monitored in the American group, 102 sites (3.2%) exhibited more than 2 mm of additional attachment loss; 26% sites no change; and 138 (4.3%) sites showed a decrease in probeable attachment level. Significant progression of disease is an infrequent event, and demonstrated that sites with initially more advanced attachment loss were no more likely to show disease progression than areas with less attachment loss.

Buckley and Crowley (1984) examined 1,016 textile workers of whom 82 had no dental treatment other than tooth extraction in the 10-year period of the study. The average age was 27.0 and average tooth loss was 2.5 teeth per individual over the observed period. The variation in pattern on destructive periodontal disease in this study suggests that the disease is intermittent in nature and is not linear in time. Teeth most frequently lost were maxillary molars. Overall 6% of teeth initially free of periodontal disease (PI=0) were lost compared to 14% with destructive periodontal disease (PI=6). The rate of progression of established periodontal disease was similar for anterior and posterior teeth, while the onset of gingivitis was more pronounced in posterior teeth.

TREATED AND NOT MAINTAINED

Nyman et al. (1977) studied 25 patients with advanced periodontal disease who were treated by 1 of 5 procedures to eliminate probing depth. Patients were instructed once in oral hygiene, not recalled for maintenance, and were evaluated at 2, 6, 12, and 24 months. The plaque scores 6, 12, and 24 months ranged from 1.1 to 1.3. A similar pattern was seen in regard to the gingival scores. The initial probing depth was 5 to 6 mm and at 6 and 12 months the probing depths varied from 2.6 and 3.3 mm. After 24 months the average depth was approximately 4 mm. At the end of the study there was a significant loss of attachment for all 5 groups on the lingual (1.2 to 1.6 mm) and approximal (1.5 to 1.9 mm) surfaces. The authors concluded that periodontal surgery will fail in those patients with poor oral hygiene who are not seen on regular recall.

De Vore et al. (1986) assessed bone levels around individual tooth groups in 23 patients treated for periodontal disease and followed with infrequent maintenance (≤ 1 visit per year). Post-therapy radiographs were taken between 2.5 to 8.3 years. Bone loss was defined as a reduction in the

TABLE 1. AVERAGE TOOTH LOSS RATE FOR TREATED AND UNTREATED PERIODONTITIS*

Study	Treatment Status	Tooth Loss Per Year	Years to Lose 1 Tooth
Lindhe et al. (1984)	Treated	0.02	43.5
Oliver (1968)	Treated	0.03	33.3
Hirschfeld and Wasserman (1978)	Treated	0.08	12.5
McFall (1982)	Treated	0.13	7.7
Nabers et al. (1988)	Treated	0.29	3.5
Becker et al. (1984)	Treated	0.11	9.1
	Treated and not maintained	0.22	4.5
	Untreated	0.36	2.8
Buckley and Crowley (1984)	Untreated	0.25	4.0 †

*Average tooth loss per patient divided by the average time in maintenance or observation.
†The rate of tooth loss is 2 to 12 times higher for untreated periodontitis.

alveolar crest of greater than 50% of the radiographic crown height which corresponds to approximately 4 mm in the posterior and 5 mm in the anterior teeth. Results showed increased bone loss and tooth loss when compared to initial presentation. Molar teeth were at more risk than incisors and canines and a lack of periodontal maintenance care and inadequate plaque control resulted in progressive bone loss following treatment.

Becker et al. (1984A) presented a retrospective report on 44 patients (1,117 teeth) treated for periodontal disease who received oral hygiene instruction, initial SR/P and 2 or more quadrants of pocket reduction therapy and who subsequently elected not to participate in the maintenance phase of treatment. The average time between examinations was 5.25 years, with a mean annual adjusted tooth loss rate of 0.22 (4.7%). The authors compare this to a mean adjusted tooth loss of 0.11 for treated and maintained patients and 0.36 for diagnosed and untreated patients. At re-examination there was a breakdown in health status of furcations, no reduction in probing depths, and worsened bone scores. It was felt that surgical intervention was of little value when there was an absence of the maintenance phase of periodontal therapy. Average tooth loss for treated and untreated periodontitis is shown in Table 1.

RESPONSE TO TREATMENT: SHORT-TERM (2 to 3 YEARS) STUDIES

A 3-year study of 1,248 patients by Suomi et al. (1971) tested the hypothesis that the development and progression of gingival inflammation and destructive periodontal disease is retarded by high levels of oral hygiene and maintenance. An experimental group received a high level of oral hygiene as well as a series of frequent oral prophylaxes, combined with OHI and dental health education. Patients in the control groups received only annual examinations, but they were

advised to continue with usual oral hygiene professional care. After 3 years, the increase in oral hygiene score was more than 4 times greater in the control when compared to experimental. Mean gingival inflammation scores were also greater in controls. The authors concluded that maintaining high levels of oral hygiene slows any progress of periodontal disease.

Nyman et al. (1975) treated 20 patients with pocket elimination surgery, who were divided into a test group who received oral hygiene instruction and professional cleaning every 2 weeks, and a control group who received tooth cleaning every 6 months. Examination was repeated 6, 12, and 24 months after the end of the treatment. The test group maintained good oral hygiene and had no further loss of attachment, while the control group experienced treatment failure with further loss of attachment. It was concluded that good oral hygiene and professional cleaning are essential for the success of periodontal surgical treatment.

In a 1976 study (Rosling et al.), 50 patients were randomly distributed into 5 groups treated by apically repositioned flap with or without resection of bony defects, Widman flap with or without elimination of the bony defects, and gingivectomy. After surgery, all patients received oral hygiene instruction and professional cleaning of the teeth once every 2 weeks during a 2-year period. Results indicated that this regimen prevented further destruction of the periodontal tissues, regardless of the surgical technique used for pocket elimination.

Axelsson and Lindhe (1981A and B) treated 90 patients with advanced periodontal disease and divided them into 2 study groups. All patients received detailed oral hygiene instructions, a scaling and prophylaxis, removal of ill-fitting margins of restorations, and surgery as needed. One group of patients was returned to the referring dentist while the other group entered a carefully-designed clinic maintenance care program. Results demonstrated that patients placed on a carefully designed recall program were able to maintain excellent oral hygiene standards and stable attachment levels over a 6-year period after treatment for periodontitis. The non-recall group lost on average 1.8 mm of attachment over the 6-year period. Patients who were not maintained in a supervised program were more prone to develop recurrent disease.

Westfelt et al. (1983) studied the significance of frequency of professional tooth cleaning for healing following periodontal surgery. Twenty-four (24) patients with moderate-advanced periodontitis were treated with modified Widman flap surgery and divided into 3 groups who received supportive periodontal care at 2, 4, or 12 week intervals for 12 weeks. After the first 6 months, recall was changed to every 3 months for all groups. At the 6-month exam, patients seen every 2 weeks had low numbers of inflamed gingival units and deep (> 3 mm) periodontal pockets; test patients seen less frequently exhibited an increasing number of inflamed gingival units and deeper

pockets. Sites exhibiting attachment loss of > 1 mm was closely related to maintenance care. Group 3 had 3 times the number of sites with attachment loss than group 1. There were no significant changes in oral hygiene status, gingival condition, or the probing depth and attachment levels in the 3 groups between the 6 and 24 month re-examinations. Critical probe depth (CPD) values were also evaluated; i.e., the initial probing depth below which loss of clinical attachment occurred and above which attachment gain had resulted. The analysis showed that the CPD value was low in patients frequently recalled during healing phase, it increased in patients with less frequent intervals (Group 1 CPD = 4.4 ± 0.3 mm; group 2 CPD = 4.9 ± 0.3 mm; and group 3 CPD = 5.4 ± 0.7 mm).

RESPONSE TO TREATMENT: LONG-TERM (6 OR MORE YEARS) STUDIES

Oliver (1969) evaluated tooth loss in a group of 442 patients treated in private periodontal practice. Maintenance periods ranged from 5 to 17 years with an average of 10.1 years. Patients were seen on average every 4.6 months for their recall. Tooth loss due to periodontal disease was 178 of approximately 11,000 teeth available for therapy. This represents an average of less than one-half a tooth per patient over the 10-year period. Seventy eight percent (78%) of the patients did not lose any teeth and 11% lost only one tooth after therapy. Only 45 teeth were lost to caries or pulpal involvement, for 0.1 tooth per patient. Results indicated that periodontal disease can be effectively treated and that tooth loss due to periodontal disease can be prevented.

In a 1978 study by Hirschfeld and Wasserman 600 patients in a private practice were reexamined an average of 22 years (15 to 53) following their active treatment. Patients were divided on the basis of response to treatment into the following groups: well-maintained (WM) (lost 0 to 3 teeth) 499 patients (83.2%), downhill (D) (lost 4 to 9 teeth) 76 patients (12.6%), and extreme downhill (ED) (lost 10 to 23 teeth) 25 (4.2%). Tooth retention seemed more closely related to the case type. In general, the percentage of tooth loss was 7.1% (1,110 out of 15,666), and 31.4% for teeth with furcation involvement. Only 666 out of 2139 teeth that originally had been considered questionable were lost. The authors noted that periodontal disease is bilaterally symmetrical, with the mandibular, cuspids, and first bicuspids being most resistant and the maxillary second molars most susceptible to loss.

McFall (1982) reviewed long-term tooth loss in 100 treated patients with periodontal disease. The study population consisted of 77 well-maintained; 15 downhill; and 3 extreme downhill patients with a total of 2,627 teeth. During the maintenance period (an average of 19 years), 259 teeth (9.8%) were lost to periodontal disease and 40 (1.5%) lost for other causes. In the WM group 43.3% of teeth designated questionable were lost, an average of 0.68 teeth per patient. In

the downhill group, 60.4% of the questionable teeth were lost (6.1 teeth per patient), and the extreme downhill group lost 48.7% of the teeth deemed questionable (14.4 teeth per patient). Of a total of 163 maxillary and mandibular furcated teeth, 94 (56.9%) were lost: WM group losing 18 (27.3%), D group losing 68.9%, and ED losing 92.3%. Following surgical treatment, 131 out of 832 teeth were eventually lost (15.8%). By comparison 128 teeth not treated surgically were lost. More surgery was performed in the maxillary than mandibular arch. Molar teeth, particularly maxillary molars, represented the highest percentage of teeth lost following surgical treatment. Mandibular canines had the best survival rate in all groups. A bilateral pattern of osseous destruction was seen.

Meador et al. (1985) reviewed 620 patient records to determine the long-term effectiveness of periodontal therapy in a clinical practice. Cases (median treatment period 7.4 years) consisted of Type I and II patients treated non-surgically, Type III patients treated by closed or open curettage or modified Widman flap (MWF), and Type IV patients treated by flap and osseous surgery. At 2-year re-evaluation intervals, patients were classified as stable ideal (SI) probing depth (PD) up to 3 mm, no tooth loss; stable satisfactory (SS) PD up to one half pre-treatment levels, tooth loss up to 4 teeth; unstable retreatable (UR) increased PD and/mobility, radiographic bone loss, tooth loss; or unstable unsatisfactory (UU) severe increase in PD, mobility, radiographic bone loss, and tooth loss. Following treatment, the stable category included 71.93% of the patients (10.48% SI, and 61.45% SS), and the unstable category included 28.07% of patients (27.1% UR, and 0.97% UU). The authors concluded that moderate surgical procedures (open curettage, MWF) were at least as effective as osseous surgery, while non-surgical and closed curettage appeared to be less effective.

In a retrospective study, Goldman et al. (1986) assessed the effect of periodontal therapy on 211 patients maintained for 15 years or longer (15 to 34 years; average 22.2 years) at 3- to 6-month intervals. There were 131 (62%) subjects in the well-maintained group, 59 (28%) in the downhill group, and 21 (10%) in the extreme downhill group. There were 467 maxillary molar and bicuspid teeth and 169 mandibular molars that presented with radiographic evidence of furcation involvement. Of these, 201 maxillary teeth (43%) and 76 mandibular molars (45%) were lost during therapy. A total of 43.5% of the teeth initially diagnosed with a furcation involvement were lost. Molar teeth are most prone to loss and mandibular cuspids were most resistant to loss. The well-maintained group lost 16.9% of teeth with furcation involvement compared to 66% in the downhill and 93% in the extreme downhill group. A total of 13.4% of all teeth were lost over the mean period of 22 years. Seventy-two percent (72%) of all patients received surgery during active treatment and only a few cases required retreatment.

Lindhe and Nyman (1984) reported on the long-term maintenance of 61 patients treated for advanced periodontal disease. Patients with 50% or more of their periodontal support lost were given detailed oral hygiene instructions, scaling and root planing, and surgical elimination of periodontal pockets and then placed on a 3 to 6 month recall and followed for 14 years. During this time 92 to 99% of all sites maintained PD < 4 mm, while less than 1% of the sites developed probing depths > 6 mm. The mean attachment level was reduced from 6.1 mm to 5.4 mm and maintained at this level. However, attachment loss did occur at 16 in sites in 8 patients during the maintenance phase, 6 sites losing 5 mm or more. During the 14 years of maintenance, 30 of the 1,330 (2.3%) teeth were lost during the course of the study, 26 for periodontal reasons. Results demonstrated that treatment of advanced forms of periodontal disease resulted in clinically healthy conditions and that this state could be maintained by patients over a period of 14 years. A small number of sites lost a substantial amount of attachment at different times of the maintenance period but mean plaque and gingival indices did not prove helpful in monitoring the isolated sites.

Knowles et al. (1979) evaluated the results of periodontal treatment related to probing depth and attachment level. Following initial treatment 78 patients had half-mouth treatment with either subgingival curettage, modified Widman flap (MWF), or pocket elimination surgery. The patients were recalled every 3 months for a prophylaxis and patients were followed for 8 years. The results showed that the reduction in probing depth (PD) and the gain in attachment were greater for the deep pockets than the moderate pockets. The initial changes 1 year after treatment were sustained over the 8-year period: 1 to 3 mm PD got slightly deeper and lost about 1 mm of clinical attachment (CAL); 4 to 6 PD were reduced approximately 2 mm with a gain of 0.5 mm in CAL; 7 to 12 PD were reduced approximately 4 mm with a gain of 2 mm CAL. The reduction in probing depth following curettage was less than the 2 other procedures, and the gain in attachment following MWF was greater than the other 2 methods.

Becker et al. (1984B) also assessed long-term periodontal treatment and maintenance in a retrospective study on 95 patients (average age 46). The frequency of maintenance intervals was planned on an individual basis, with a median of 5.2 months. The average time between exams was 6.58 years with a loss of 6.21% of the total teeth (annual loss of 0.24/year). When hopeless teeth were adjusted for tooth loss was 2.94% (0.11/year). Of molars without furcations at first examination, 87.8% remained stable. Pooled patient means for probing depths were 3.787 mm initially and 3.409 at second exam. Fifty-five percent (55%) of the pockets between 4 to 6 mm were reduced to 1 to 3 mm at re-examination. No evidence of bone loss was seen in ~50% of the patients. Of teeth initially identified as hopeless, 80% were missing at the second examination; only 1.7% of the "good" teeth, and 25% of the questionable teeth were lost.

Results indicated that periodontal therapy and maintenance were successful in reducing moderate to deep periodontal pockets with minimal long-term bone loss. In the year after the study was completed, 22% of the patients had dropped out of the maintenance program.

In a similar study, Nabers et al. (1988) reported on 1,535 treated periodontal patients who averaged 12.9 years since completion of treatment. No teeth were lost due to periodontal disease in 1,371 patients and a total of 444 teeth were lost from a group of 164 patients, an overall tooth loss rate of 0.29 for the entire patient group. Initially, 26.5% were treated non-surgically and 73.5% were treated surgically. Although many patients developed recurrent periodontal problems during recall, only 15.9% of the 1,535 patients required surgical retreatment. Teeth originally given a doubtful prognosis often were responsible for recurrent problems and sometimes required extraction.

Wennstrom et al. (1993) examined periodontal conditions of adult, regular dental care patients. The 12-year study of 225 randomly selected patients offered annual preventive care at 12 community dental clinics in Sweden indicated an overall low incidence of tooth loss (0.4) and periodontal disease. A decrease in gingival scores from 15% to 4% was also observed, with no change in probing depth. The mean probing attachment loss during the 12 years was 0.5 mm. Tooth site analysis revealed that buccal sites had more loss of attachment than lingual and approximal surfaces. Radiographic assessment of the alveolar bone height revealed a mean longitudinal loss of 0.2 to 0.4 mm. The mean longitudinal changes were similar in all age groups, showing that therapy provided was equally effective in all age groups, although differences in rate of deterioration may be due to individual differences in environmental or disease conditions. Almost all patients (96%) had at least 1 site with ≥ 2 mm of attachment loss during the 12 years of follow-up.

EFFECT OF PLAQUE AND GINGIVITIS ON MAINTENANCE

Ramfjord et al. (1982) reviewed oral hygiene and maintenance of periodontal support. Seventy-eight (78) patients were treated and maintained with 3 month recalls over a period of 8 years. Variations in probing depth and attachment levels were related to individuals with plaque scores above and below the median. Results indicated personal oral hygiene, based on plaque scores, was not critical for maintenance of post-treatment probing depth and attachment levels in patients receiving professional tooth cleanings every 3 months over the 8 years. After 1 year, there was no indication that individuals with poor oral hygiene had any greater loss of attachment than those with good oral hygiene.

In a companion paper, Morrison et al. (1982) reported on 78 patients in a 7-year longitudinal study which compared the effect of gingivitis on the maintenance of probing depth reduction and clinical attachment levels. For probing depths 1 to 3 mm and 4 to 6 mm there was no difference in pocket reduction maintenance. There was no difference in attachment response in 1 to 3 mm probing depths, and in 4 to 6 mm PD, lower gingivitis scores had better gain the first 2 years, but thereafter no difference was recorded. For 7 to 12 mm PD, lower gingivitis scores seemed to result in better probing levels and attachment gain for the first 3 years, but this was not maintained throughout the study. The authors concluded that the severity of recurrent gingivitis with 3-month recall and maintenance following therapy had little effect on probing depth and attachment level.

SUPPORTIVE THERAPY

According to Chace (1951), maintenance of the treated periodontal patient should be carefully considered and a definite routine established. Pertinent factors include patient education, oral hygiene reinforcement, full-mouth radiographs every 2 years, and 2 to 3 month recall intervals. The hygienist is an indispensable aid to the periodontist in preventive treatment, but a thorough examination of the occlusion and gingival crevice is necessary.

In a subsequent article, Chace (1967) indicated that the general dentist who participates in the maintenance of periodontal patients assumes far greater responsibilities than he does in the care of the average patient. This requires an understanding of periodontal pathology, basic periodontal procedures, techniques necessary for the use of fine curets, and time demands of preventive treatment. The general dentist must be aware of the tendency of the development of new periodontal lesions, just as the periodontist must be aware of patients' needs relative to total dental care.

Chace (1977) also suggested that patients treated for periodontal disease may be susceptible to recurrent periodontitis. Some patients tend to have recurrences despite exemplary care, necessitating retreatment. Reasons for regression must be thoroughly evaluated and may include oral hygiene regimen, surgical technique, occlusal factors, and systemic factors. Patients should be prepared psychologically and informed of the possibility of additional future treatment. Surgical retreatment should be performed if indicated, but if the deepened crevice does not bleed when probed and is not accompanied by bone loss surgery is not justified.

Based on epidemiologic studies, Schick (1981) noted that a maintenance program should provide adequate therapy for previously existing periodontal conditions. Initially, the patient should be provided with a thorough prophylaxis and complete reinforcement instructions in oral hygiene procedures every 3 months. The 3-month interval should be increased, maintained, or decreased depending on an evaluation of the stability of the supporting structures. Close monitoring will indicate the appropriate time interval for each individual patient, and if necessary retreatment determined for those areas that may be deteriorating.

Schallhorn and Snider (1981) reviewed practical management of periodontal maintenance and performed a time study to determine how the therapist's time is actually spent during a maintenance visit. The authors indicate that prevention of periodontal disease occurs at 3 levels: preventing the inception of disease; preventing progression of existing disease; and preventing recurrence of disease following treatment. The authors indicated 4 types of periodontal maintenance therapy (PMT): preventive PMT; trial PMT (allows time for decisions regarding definitive therapy); compromise PMT (i.e., palliative maintenance); and post-treatment PMT (provided to prevent disease recurrence). The authors state that most periodontal therapy should include a 3-month recall but that intervals may range from 1- to 6-months, with the typical appointment taking 52.61 minutes. Factors influencing the maintenance interval include oral hygiene, level of calculus formation, and various host factors.

Lang et al. (1986) evaluated bleeding on probing (BOP) as a predictor for the progression of periodontal disease in 55 patients following treatment and at least 4 years of maintenance at 4 to 5 month intervals. The incidence of bleeding on probing (BOP) during the last 4 recall visits was calculated for all sites of all teeth. Out of 7,704 teeth, 1,054 pockets were selected and subdivided into 5 groups according to the incidence of BOP of 4/4 and 3/4 were selected, interproximal sites with a BOP incidence of 2/4, 1/4, and 0/4 were chosen. These categories were grouped according to attachment level at the time prior to last 4 recall visits. Clinical attachment loss (CAL) was defined as ≥ 2 mm. Results indicated that pockets probing ≥ 5 mm had a significantly higher incidence of BOP and that 196 (2.5%) had sites BOP 75% to 100% of the time. Patients with 16% of more BOP sites had a higher chance of CAL. The percent of pockets with CAL was 30% when the incidence of BOP was 4/4; 14% when BOP was 3/4; 6% when BOP was 2/4; 3% when BOP was 1/4; and 1.5% when BOP was 0/4. Sensitivity and predictability calculations revealed that BOP is a limited, yet useful, prognostic indicator in clinical diagnosis for patients in maintenance phase. Initial therapy included debridement with OHI, followed by flap curettage procedures and preventive maintenance therapy. A total of 55 (12%) teeth were lost with an average survival rate of 8.8 years prior to extraction. The majority of teeth lost were maxillary second molars (38.2%), followed by maxillary first molars (25.5%), and mandibular second molars (16.4%). Tooth loss patterns were bilaterally symmetrical. The majority of the patients demonstrated above average compliance for oral hygiene and frequency of recall. The authors concluded that teeth with questionable prognosis can often be retained for many years with maintenance and compliance.

COMPLIANCE

Wilson et al. (1984) evaluated 961 patients from a private periodontal practice for compliance with suggested maintenance schedules over a period of 8 years. Patient compliance was encouraged by informing them of the importance of maintenance, notifying either by telephone or mail to schedule an appointment. Of these patients, only 16% complied with recommended maintenance schedules, erratic compliance was found in 49% of the patients, and 34% never reported for any maintenance therapy. It is suggested that as a result the patient's past history of compliance may modify the therapeutic approach employed.

Wilson reviewed compliance (1987A), noting that the medical literature suggests that patients with chronic illnesses tend to comply poorly, especially if the disease is not perceived to be threatening. The reasons for non-compliance are highly variable from fear, economics, and lack of compassion from the dental therapist. In periodontics, the focus is on the effectiveness of oral hygiene and on maintenance therapy. It is not that patients comply better when they are informed and positively reinforced, and when barriers to treatment reduced.

Wilson et al. (1987B) reported on a group of 162 maintenance patients from a previous study (Wilson et al., 1984) for tooth loss over a 5-year period. The group was divided into 2 groups, the compliant (58) and the erratic (104). All tooth loss had occurred in the erratic group (0.6) and it noted that the more often a patient presented for maintenance, the less likely he was to lose teeth.

Mendoza et al. (1991) identified 637 patients from their records as being compliant or non-compliant based on recommended SPT visits. Results indicated that there was no difference in compliance between sex, age, or disease severity. More non-compliant patients were smokers, whereas compliant patients had more periodontal surgery during treatment. Of the patients, $\sim$ 30% failed to return for their first recall appointment and another 12% ceased SPT during the first year, resulting in an average non-compliance of 42.8% for the first year. Attrition rate decreased in subsequent years to average 10% of those remaining in each year, indicating that patients are more likely to remain compliant if they continue SPT at least 1 year. A questionnaire was sent to non-compliant patients, with 40% of the patients replying. The most common reason for their non-compliance was that a general dentist was attending to their needs; many considered SPT too expensive, while others thought they no longer required treatment.

Six-hundred and four (604) periodontal patients undergoing SPT were evaluated by Wilson et al. (1993) and the results of efforts at improving compliance in a private periodontal practice assessed. These efforts included attempts at simplifying compliance, maintaining records of compliance, informing patients of the consequences of non-compliance and attempting to identify non-compliers before active periodontal treatment. Results indicated that 32% were complete compliers, 48% were erratic, and 20% were non-compliers. The main finding of the 1993 study was an increase in complete compliance from 16% in the 1984

TABLE 2.   RESPONSE PATTERNS OBSERVED IN STUDIES OF PERIODONTAL TREATMENT IN PRIVATE PRACTICE

Study	Response Pattern	Teeth Lost	Percentage of Patients	Number of Patients
Hirschfeld and	WM	0-3	83.2	499/600
Wasserman (1978)	DH	4-9	12.6	76/600
	EDH	10-23	4.2	25/600
McFall (1982)	WM	0-3	77.0	77/100
	DH	4-9	15.0	15/100
	EDH	10-23	8.0	8/100
Goldman et al. (1986)	WM	0-3	62.0	131/211
	DH	4-9	28.0	59/211
	EDH	10-23	10.0	21/211
Meador et al. (1985)	SI	0	10.48	65/620
	SS	1-4	61.45	381/620
	UR	>4	27.10	168/620
	UU	All	0.97	6/620

WM = well maintained; DH = downhill; EDH = extreme downhill
SI = stable ideal; SS = stable satisfactory; UR = unstable
retreatable; UU = unstable unsatisfactory

report (Wilson et al.) to 32%. This increase was at the expense of the non-compliant group, and largely due to the efforts of the office. It was suggested that increased recognition and better patient education can help reduce the problem of noncompliance.

Schmidt et al. (1990) studied patient compliance in 631 patients who had undergone active periodontal therapy, consisting of S/RP with (65.9%) and without periodontal surgery (34.1%). Results demonstrated excellent compliance (95%) to suggested maintenance recall. Both full (75 to 100%) and erratic compliers (< 75%) were able to maintain periodontal health over time, but erratic compliers required more surgical retreatment. Smokers exhibited poorer oral hygiene, more tooth loss, and deeper probing depth compared to non-smokers. The percentage of compliance did not appear to change over time; however, the less frequently patients were required to come for recall, the greater their compliance: ~70% of the patients were on 3-month recall and 30% were on 4-month. Patients who alternated recall with their general dentist maintained their periodontal health as well as patients seen only at the periodontist's office.

Patients' response patterns in private practice are shown in Table 2.

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