Original Article

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Patient accessibility to supportive periodontal therapy and the occurrence of recurrent periodontitis: a retrospective study in the Faculty of Dentistry, Mahidol University

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Objective: To describe patient accessibility to supportive periodontal therapy (SPT) and the occurrence of recurrent periodontitis in SPT patients.

Material and Methods: Retrospective data were collected from the patients' medical records who had completed active periodontal therapy (APT) from August 2011 to July 2013 at the Postgraduate Periodontal Clinic, Faculty of Dentistry, Mahidol University.

Results: Ninety-nine patients were included in the study and 68 were registered to enroll for SPT. Among these, 45 patients had attended at least one SPT appointment. By the end of the observation period the total number of SPT appointments for these patients was 84. Only 20 appointments were concordant with the suggested SPT interval, while the remainder were between 2 and 8 months behind schedule. Most of the patients (87.9%) who attended SPT were classified as unstable cases at the end of the APT, with 73.3% having recurrent periodontitis.

Conclusions: The majority of the registered patients attended their SPT appointments that were mainly not in concordance with the suggested time intervals. A high occurrence of recurrent periodontitis was reported among these SPT patients. The SPT service at the clinic needs to be completely overhauled and revised to improve efficiency and reduce the risk of recurrent periodontitis.

Keywords: accessibility, recurrent periodontitis, SPT intervals, supportive periodontal therapy

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Introduction

Periodontal treatment is conducted to maintain teeth functional health and reduce long-term excessive mobility or persistent infection. It can be divided into two phases as active periodontal therapy (APT) and supportive periodontal therapy (SPT). Plaque control, scaling and root planing or adjunct with antimicrobial agents in some cases to combat infection are performed during APT. In cases of severe disease progression, periodontal surgery may be considered. After completion of APT, SPT maintains a healthy periodontium and prevents the recurrence of the disease [1-3]. Therapy frequency intervals among patients differ. Merin [4] recommended that treatment intervals should be no more than three months during the first year. High-risk patients should have SPT every 3 to 4 months, while low-risk patients can have a longer duration of once per year [5-7].

Axelsson & LIndhe [8] found that patients who received SPT regularly after periodontal surgery maintained periodontal health, with low bleeding on probing and stable probing depth as

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well as clinical attachment level. By contrast, patients who did not receive SPT experienced signs of recurrent periodontal disease. Higher clinical attachment loss or recurrence of periodontitis was recorded in patients who did not attend regular SPT after completing APT than in those who regularly attended [9-15].

For tooth mortality, Becker *et al.* [16] reported a mean tooth loss of 0.11 teeth per patient per year in treated and maintained periodontal patients, while the figure was 0.22 in patients who were treated but elected not to participate in SPT [17]. Similarly, Ng *et al.* [18] reported tooth loss at 0.09 per patient per year after APT, while tooth loss was three times higher at 0.29 in non-compliant patients. Seven years after APT, tooth loss in non-compliant patients was seven times higher than in compliant patients [18].

Patients benefit from SPT compliance [19]; however, several studies showed that many patients did not adhere to SPT guidelines. Wilson *et al.* [20] demonstrated that eight years after active periodontal treatment, out of almost 1,000 patients only 16% complied with SPT intervals. Most patients (49%) were erratic compliers (missing some appointments), while 34% did not return after APT. Delatola *et al.* [21] recorded only 10% patient compliance over a period of 5-6 years, while Wilson [22] reported the loss of 60 teeth in erratic compliers during SPT over five years but none in regular compliers.

Adequate adherence to SPT requires the combined and continued efforts of both patients and service providers. To improve access to SPT after APT at timely intervals and decrease disease recurrence, the Postgraduate Periodontal Clinic, Faculty of Dentistry, Mahidol University, has operated a recall system for SPT patients since 2012. However, this system has never been formally evaluated. This study described the SPT service accessibility by periodontal patients after APT and the occurrence of recurrent periodontitis in this group of patients. Results can be used to improve the SPT service system to maximize the benefits for periodontal patients.

Materials and Methods

This retrospective study was approved by the Ethics Review Committee for Human Research at the Faculty of Dentistry and Faculty of Pharmacy, Mahidol University (MU-DT/PY-IRB2018/DT048). Demographics and clinical data were collected from patient records at the Postgraduate Periodontal Clinic, Faculty of Dentistry, Mahidol University. Patients with chronic and aggressive periodontitis [23] were treated at the clinic by postgraduate students as a part of their educational training. All periodontal patients were thoroughly examined, diagnosed and treated by means of non-surgical periodontal therapy. Each patient was then re-evaluated and treated with periodontal surgery where indicated. Following the completion of APT, all patients were referred to enroll in the clinic recall system for SPT. The first SPT interval was determined at the end of APT, with subsequent intervals determined at each SPT visit. The interval of SPT varied from 1, 2, 3, 4, 6, and 12 months based on the results after periodontal therapy as well as the number and severity of negative factors [4]. Treatment was provided by a postgraduate student at each SPT visit.

Patients who completed APT at the Postgraduate Periodontal Clinic from August 2011 to July 2013 were included in the study. Information collected included-age (at the end of APT), gender (male/female), history of diabetes mellitus (yes/no), self-reported smoking habit (yes/no), pretreatment periodontal diagnosis (severe chronic periodontitis/slight or moderate chronic periodontitis/aggressive periodontitis) [23], APT modality (non-surgical periodontal therapy/

surgical periodontal therapy), number of remaining teeth at the end of APT, enrollment for SPT at the Postgraduate Periodontal Clinic (yes/no), last date of APT, and suggested and attended interval of the first and subsequent SPT sessions. The suggested interval of SPT was the time interval which was selected differently among each patient. The attended interval of SPT was the time interval in which the treatment providers provided SPT service. In addition, the SPT service was considered satisfactory and delivered in a timely manner if treatment was conducted within 30 days of the suggested SPT interval. Periodontal treatment parameters at six sites per tooth were also sourced from patient records at the end of the APT visit and after each SPT visit until December 31, 2017. These parameters included sites with BOP, PD and clinical attachment level (CAL).

After APT, patients were assigned to one of three groups according to their periodontal status following Chapple *et al.* [24] as I-a successfully treated cases with gingival health where PD < 4 mm (no site ≥ 4 mm with BOP) and BOP < 10%, II-a successfully treated patients with gingivitis where PD ≤ 3 mm and BOP ≥ 10%, and III-a treated unstable patients not fitting into categories I or II.

The recurrence of periodontitis was defined as a patient with at least one site with increased ≥ 2 mm CAL loss [25]. Patients were recorded as having recurrent periodontitis if they experienced the disease recurrence at least once during the SPT visits.

Statistical methods

The demographics and clinical characteristics of the subjects were identified by appropriate descriptive statistics: percentage, frequency, mean and standard deviations.

Results

Medical records of 115 patients who completed APT from August 2011 to July 2013 were retrieved, while 16 patient records were excluded due to inadequate information. Therefore, the medical records of 99 patients were included in this study (Figure 1).

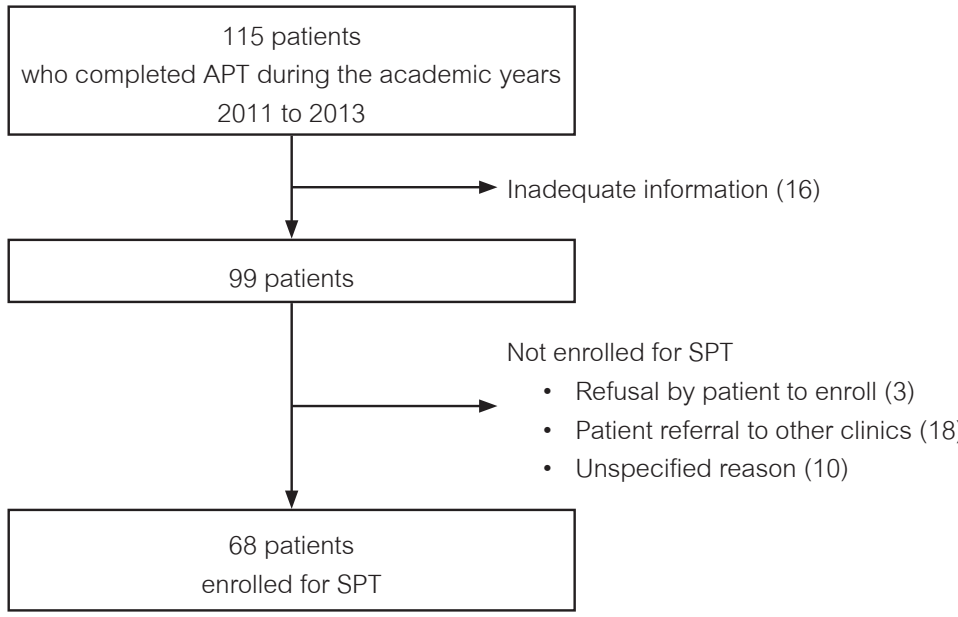

Figure 1 Flowchart of patient enrollment

Demographics and clinical data of the patients

Demographics and clinical data are presented in Table 1. Sixty-one percent of the patients were 45-64 years old with a mean age of 54.6 ± 11.9 years. There were more females than males, and patients were mostly non-smokers and non-diabetic. Ninety patients were diagnosed with severe chronic periodontitis. All patients were treated with non-surgical therapy, with 67 out of 99 also treated with periodontal surgery. After completing APT, patients had an average of 23.4 ± 12.6 teeth remaining with most (70.7%) recording more than 20 teeth remaining.

Table 1 Patient demographics and clinical data (N = 99)

	n	%
Age group (years) (mean ± SD = 54.6 ± 11.9)		
< 45	19	19.2
45 - 54	29	29.3
55 - 64	31	31.3
> 65	20	20.2
Sex		
Male	40	40.4
Female	59	59.6
Diabetes mellitus		
Yes	11	11.1
No	88	88.9
Smoking habit		
Yes	4	4.0
No	95	96.0
Pretreatment periodontal diagnosis		
Severe chronic periodontitis	90	90.9
Slight or moderate chronic periodontitis	5	5.1
Aggressive periodontitis	4	4.0
Active periodontal treatment modality		
Non-surgical therapy only	32	32.3
Non-surgical therapy + surgical therapy	67	67.7
Number of remaining teeth (mean ± SD = 23.4 ± 12.6)		
< 10	4	4.0
10-20	25	25.3
≥ 21	70	70.7

Post-treatment periodontal parameters and periodontal status

Results in Table 2 show that BOP at less than 10% was present in 22.2% of patients after completion of APT. Only 9.1% presented PD between 1 and 3 mm, while the remainder still had residual PD ≥ 4 mm. PD of 4 mm ranged from 1-49 sites in 41 patients, while PD ≥5 mm ranged from 1-13 sites in 49 patients.

When post-treatment PD and BOP were considered concurrently, according to Chapple *et al.* [24] 8.1% and 4% of the patients were successfully treated for gingival health and gingivitis, respectively. The majority (87.9%) were classified as treated unstable cases (Table 2).

SPT enrollment

After APT, three patients refused to enroll for SPT, 10 patients were not enrolled for unspecified reasons and 18 patients were enrolled for SPT at other clinics (Figure 1). Among patients enrolled for SPT at the Postgraduate Periodontal Clinic, 61 out of 68 were assigned for treated unstable cases after APT (Table 3).

Table 2 Periodontal parameters and patient status after active periodontal treatment (N = 99)

	n	%
Percentage of sites with bleeding on probing		
< 10%	22	22.2
10 - 20%	31	31.3
21 - 40%	37	37.4
≥ 41%	9	9.1
Probing depth		
1 - 3 mm at all sites	9	9.1
4 mm at least one site	41	41.4
≥ 5 mm at least one site	49	49.5
Post-treatment periodontal status		
I-Successfully treated cases with gingival health	8	8.1
II-Successfully treated cases with gingivitis	4	4.0
III-Treated unstable cases	87	87.9

Table 3 Patient distribution (N = 99) by periodontal status after active periodontal treatment (APT) and the enrollment for supportive periodontal therapy (SPT) at the Postgraduate Periodontal Clinic

		Enrollment for SPT	
		Yes (n = 68)	No (n = 31)
Post-treatment periodontal status	I	5	3
	II	2	2
	III	61	26

I-Successfully treated cases with gingival health

II-Successfully treated cases with gingivitis

III-Treated unstable cases

Attended SPT visit

Table 4 shows the distribution of 45 returning patients as those who attended SPT visits and the suggested duration of SPT. The number of attended SPT visits of each patient ranged from 1 to 5, while about half of the patients attended only 1 SPT visit during their duration of SPT. Only 1 patient attended 5 SPT visits during the 3-year duration.

Post-treatment periodontal status and suggested SPT interval

The suggested first SPT intervals of all returning patients (N = 45) ranged from 1 to 6 months, while the suggested frequency intervals were 3 months (77.8%) and 6 months (17.8%). Among the 35 patients with a suggested first SPT interval of 3 months, 33 were treated unstable cases, while 2 were successfully treated cases with gingival health. Among 8 patients with a suggested first SPT interval of 6 months, 5 were treated unstable cases, 1 case was successfully treated with gingival health and 2 cases were successfully treated with gingivitis. One treated unstable patient and one successfully treated case with gingival health were suggested to receive the first SPT at 1 month and 4 months intervals, respectively (Table 5).

Concordance between suggested and attended SPT

In total, 84 SPT visits were provided to all 45 patients, with 45 visits for the first SPT and 39 visits for subsequent SPTs. The SPT was considered to be delivered in a timely manner if the service took place within 30 days of the suggested SPT interval. Table 6 shows the concordance of suggested and attended SPT intervals at 8 out of 45 for the first SPT visit and 12 out of 39 for subsequent SPT visits. Most of the attended SPT visits were behind schedule by between 2 and 8 months.

Table 4 Distribution of patients (N = 45) returned for supportive periodontal therapy (SPT) by the suggested duration of SPT and the number of attended SPT visits

		Suggested duration of SPT (years)			
		1	2	3	4
Number of attended SPT visits	1	2	9	12	1
	2	-	7	3	-
	3	-	4	1	-
	4	-	-	5	-
	5	-	-	1	-

Table 5 Distribution of patients (N = 45) returned for supportive periodontal therapy (SPT) by their post-treatment periodontal status and the suggested first SPT interval

		Suggested first SPT interval (months)			
		1	3	4	6
Post-treatment periodontal status	I	-	2	1	1
	II	-	-	-	2
	III	1	33	-	5

I-Successfully treated cases with gingival health

II-Successfully treated cases with gingivitis

III-Treated unstable cases

Table 6 Distribution of supportive periodontal therapy (SPT) visits (N = 84) by suggested and attended intervals

		Attended SPT interval (months)									
		2	3	4	5	6	7	8	9	10	11
Suggested first SPT interval (months)	1	-	-	-	1	-	-	-	-	-	-
	3	-	1	2	3	16	6	6	-	-	1
	4	-	-	-	-	1	-	-	-	-	-
	6	-	-	-	-	2	3	2	1	-	-
Suggested subsequent SPT interval (months)	1	1	-	-	-	-	-	-	-	-	-
	3	-	2	1	3	6	5	4	1	1	-
	4	-	-	-	-	-	-	-	-	1	-
	6	-	-	-	1	5	3	3	1	1	-

= Concordance of suggested and attended SPT intervals

Occurrence of recurrent periodontitis and SPT concordance

Among the 45 patients who received SPT at least once, 33 (73.3%) were diagnosed with recurrent periodontitis. Recurrence mainly occurred at the first SPT (31 out of 33), while 2 patients were diagnosed at subsequent SPTs. As shown in Table 7, 28 out of 31 recurrent cases at the first SPT did not receive the SPT service concordant with their suggested treatment interval.

Discussion

This retrospective study was conducted in 99 patients who received APT from periodontal postgraduate students from August 2011 to July 2013. The SPT service was first established at the Postgraduate Periodontal Clinic in 2014 to provide appropriate SPT follow-up intervals after completing APT. Results demonstrated detrimental issues that can be resolved to improve the SPT service. All patients who completed APT should be registered and assigned a suitable SPT interval by the postgraduate student who provided the service unless the patient refused to be registered. Our study results showed that approximately 30% (31 out of 99) of the patients did not enroll for SPT at the Postgraduate Periodontal Clinic. Reasons for not registering were not recorded in the medical records for 10 of the 31 patients, possibly because the dentist did not suggest SPT and process the enrollment with clinical staff. The management of the service system should be improved to ensure that all patients are offered the chance to enroll for SPT after completing APT. Reasons for refusing enrollment should also be recorded.

Table 7 Number of patients (N = 45) returning for first supportive periodontal therapy (SPT) by disease recurrence and concordance of suggested and attended SPT interval

		Recurrent at the first SPT		
		No	Yes	Total
Suggested and attended SPT interval	Concordance	5	3	8
	Non-concordance	9	28	37

Twenty-three out of 68 patients (34%) who registered for SPT at the Postgraduate Periodontal Clinic did not attend any SPT sessions, while the remaining 45 patients attended SPT at least once. Approximately half of these patients received one treatment, with an average of 2.5 ± 0.7 years (range 1-4 years) after registration. Wilson [22] reported that patients did not comply with the suggested follow-up treatments because of self-destructive behavior, fear, economic factors, health beliefs and perceived dental indifference. In contrast, Echverria *et al.* [26] suggested that patients did not comply with SPT because they were unaware of the need for further treatment. Therefore, dentists should consider these factors into account, and communicate with their periodontal patients to explain the benefits of SPT and the importance of follow-up treatment.

For the 45 patients who attended SPT, 84 SPT services were provided but only 20 attended SPT services that were concordant with their suggested schedules. The remaining 64 SPT services were between 2 and 8 months (average 3.57 ± 1.3 months) behind schedule due to improper clinical management including an imbalance of service hours and number of patients, number of treatment providers, and inefficiencies in the SPT registration system. Delays also occurred due to patients postponing their appointments. Postgraduate Periodontal Clinic staff should operate a patient tracking system and record the reasons for postponed treatments to optimize solution management.

The occurrence of recurrent periodontitis in the 45 patients who received SPT at least once was high (73%), and possible due to many factors including the delayed SPT service from the suggested SPT schedule and the fact that most patients who received SPT (43 out of 45 cases) were unstable cases, according to Chapple *et al.* [24], after APT. The number of recurrent cases in the patients whose suggested and attended SPT interval was concordance was lower (3 out of 8) than in the non-concordance group (28 out of 37). Therefore, the service system should be improved to service on time with the suggested interval. The failure to achieve endpoints of APT was partly caused disease recurrence. Most of the patients following APT were still diagnosed as unstable cases (87.9%) was partly possible that those were severe cases and the pocket elimination was not accomplished. In the past, the end point of APT depended on the instructor's treatment philosophy. But nowadays the goal after is PD < 4 mm according to Chapple *et al.* (2018) [24]. When this new criterion was applied to the patients in this study, most of the patients were unstable cases. Matuliene *et al.* stated that at least one site with PD ≥ 6 mm after APT presented a statistically significant risk factor for disease progression with the need for re-treatment [27]. Furthermore, evidence suggested that PD ≤ 4 mm without BOP in patients with full-mouth bleeding scores < 30% after APT showed the highest chance of stability of periodontal health and the lowest risk of tooth loss [28] Therefore, these patients were at higher risk of recurrent periodontitis and required close monitoring of periodontal status during SPT. Consequently, a longer duration period of treatment for SPT was needed in these cases compared to stable cases [29]. Therefore, the endpoint of APT before patient referral to SPT should also be reconsidered.

Patients successfully treated with stable periodontal health received SPT every 3 to 4 months. A 3 to 4-month SPT interval was previously suggested [5, 30], with the rationale that frequent maintenance care was necessary to eliminate/reduce subgingival proportions of pathogens associated with periodontitis. Recolonization of pathogens in previously treated periodontal pockets occurred quickly if oral hygiene was not properly maintained [31-33]. Rosen *et al.* [7] studied the effects of 3-, 6-, 12- and 18-month intervals between SPTs. With the exception of a trend of some rebounding sites ≥ 6.0 mm and attachment loss at molar sites with furcation invasion in the 18-month recall group, no differences were found between the groups. This supported our findings that 9 of 14 non-recurrent cases [26] did not meet their suggested

appointments. The criteria used to diagnose recurrent periodontitis in this study included increased CAL only [25], while Cortellini *et al.* [34] used other factors such as increased PD and BOP. The presence of all these parameters at the same site suggested that the pathology found was more likely from periodontitis rather than other causes, indicating that periodontal treatment was required. Thus, if patients in this study with at least one site of increased PD ≥2 mm with BOP and ≥2 mm increased CAL loss were diagnosed with recurrent periodontitis [34], there would be 24 non-recurrent cases. Also, 21 out of these 24 patients did not meet their SPT suggested appointment (data not shown), and frequent SPT intervals were unnecessary in these cases. The reason why appointments of other patients were later than suggested was partly explained by the limited workforce in SPT services. Normally, SPT services at the Postgraduate Periodontal Clinic operated three times a week, and patients were scheduled at 90 minutes per service. Therefore, to serve SPT every three months would require 72 patients to be attended on schedule. This was impossible because the number of SPT patients was accumulative.

These results suggest that individualizing SPT intervals based on the assessment of patient risk profiles for further periodontal disease progression may be useful [2]. Using the criteria adopted by Chapple *et al.* [24] to classify patients' periodontal health status after APT could also assist the dentist in determining the appropriate SPT interval. Nowadays, the Postgraduate Periodontal Clinic provides a 90-minute treatment for each SPT patient. This time-consuming SPT service may be partly due to residual deep PD that requires more treatment duration. Therefore, supportive periodontal care provided in the Postgraduate Periodontal Clinic should be less than 90 minutes to serve more patients. Specialist practices offer 30-minute appointments for SPT [35], while Schallhorn & Snider [36] suggested that an appropriate time required for SPT was approximately one hour.

Conclusions

Most attended SPT follow-up appointments were not in concordance with the suggested SPT time intervals. The endpoints after APT should be revised and achieved before entering SPT. The assessment of these endpoints should be used to schedule appropriate SPT intervals better. Improvement of the SPT service at the Postgraduate Periodontal Clinic is urgently required to improve efficiency and, thereby, reduce the risk of recurrent periodontitis.

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