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Relationship between attitudes toward oral health at initial office visit and compliance with supportive periodontal treatment

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Abstract

Objectives: The objectives of the present study include investigation of the relationship between attitudes and desires with respect to oral health at initial office visit and compliance with supportive periodontal treatment (SPT) and identification of prognostic factors with respect to low-compliance with SPT.

Materials and Methods: Four hundred thirty-one patients were evaluated. Subjects completed a questionnaire concerning attitude and desire with respect to oral health and subjective symptoms prior to periodontal treatment. Survival probabilities of SPT were estimated by the Kaplan–Meier method and compared between answers for each item of the questionnaire via the Cox–Mantel test. Finally, a multivariate Cox proportional hazards regression model was constructed, which included age and gender.

Results: Greater than 95% of participants desired toothbrushing proficiency and lifelong retention of teeth at the initial office visit; however, the overall survival probabilities of SPT were only 52.7% after about 5 years. Patients exhibiting unfavourable attitudes toward oral health at the initial office visit, in comparison with those displaying favourable attitudes, exhibited greater tendency to abandon SPT. A Cox regression model revealed that lack of brushing on the gingival margin, non-use of an inter-dental brush or dental floss, non-use of fluoride toothpaste and frequent consumption of sugar-containing drinks were significant independent prognostic factors for low-compliance with SPT ($p < 0.05$; Hazard ratios = 2.27, 2.00, 2.56 and 2.06, respectively).

Conclusions: Desire for satisfactory oral health is not related consistently to continuation of SPT. Unfavourable attitudes toward oral health were correlated to low-compliance with SPT. Clinicians may wish to establish methods for improvement of patient compliance employing behavioural approaches applicable to the attitudes of potential low-compliance individuals.

Key words: compliance; supportive periodontal treatment; survival analysis

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It is generally accepted that supportive periodontal treatment (SPT) is essential for successful periodontal therapy. Successful SPT depends primarily on patient compliance; the lack of compliance with respect to maintenance therapy is a significant factor for risk of periodontitis progression (Lang et al. 1997). Unfortunately, previous reports indicated that patients found compliance with SPT difficult to maintain for extended periods. Approximately 20–40% of patients dropped out at the beginning of the SPT schedule (Wilson et al. 1984, Demetriou et al. 1995, Novaes et al. 1996, Ojima et al. 2001). After more than 5 years, only half of patients continued their SPT programs (Demetriou et al. 1995, Novaes & Novaes 1999). The ability to identify individuals at higher risk of low-compliance might afford the application of special efforts in order to motivate them and to emphasize the importance of SPT

during active periodontal treatment (APT).

Compliance, or patient adherence, has been defined as the beliefs necessary to follow preventive or treatment recommendations (Blinkhorn 1993). Numerous studies have addressed the relationship between patient compliance and preventive dental regime. For example, reasons provided for non-compliance with respect to oral hygiene include unwillingness to perform oral self-care (Weinstein et al. 1983), lack of motivation (Syrjälä et al. 1994) and poor dental health beliefs (Kühner & Raetzke 1989). In terms of compliance with SPT, previous investigations have shown that patient characteristics, such as age or gender, are related to degree of compliance (Mendoza et al. 1991, Novaes & Novaes 1999). Compliance is likely to depend on social and psychological factors, which may interact with one another or with confounding variables (Friedman & DiMatteo 1989); consequently, the influence of background factors, such as attitudes and beliefs regarding oral health, on compliance with SPT should be considered.

To the best of our knowledge, no reports appear in the literature concerning the relationship between compliance with SPT and the aforementioned factors. The objectives of the present study include investigation of the relationship between attitudes and desires at initial office visit and compliance with SPT and identification of prognostic factors associated with low-compliance with SPT.

Material and Methods

Four hundred thirty-one patients (158 males and 273 females), who initially presented to the Clinic of Preventive Dentistry at Osaka University Dental Hospital between 1998 and 2002, participated in this study. Subject ages ranged from 19 to 85 years (mean age, 50.1 ± 15.4 years). Patients had been referred to our clinic for oral examination or periodontal treatment; furthermore, each patient had completed APT without surgical intervention, which was to be followed by SPT. Deceased patients or those individuals unable to visit the hospital because of relocation were excluded. Maintenance visits were scheduled at 3- to 12-month intervals according to individual plaque control, the number of sites with residual pockets and/or sites characterized by the presence of bleeding on probing. Reminders were routinely sent by mail 2–3 weeks prior to SPT appointments. It was possible to change the date of an appointment by telephone.

Patients completed a questionnaire regarding oral health upon initial admission to the clinic. Answers were evaluated by dentists during an interview. The questionnaire consisted of three sections: attitudes toward and desire for oral health, and subjective symptoms. The section pertaining to attitudes toward oral health included six questions: ''Do you brush carefully on the gingival margin?'', ''Do you use inter-dental brushes or dental floss?'', Do you use a fluoride toothpaste?'', ''Have you received toothbrushing instruction before?'', ''Do you frequently consume sugar-containing drinks?'' and ''Do you smoke at present?''. Individuals displaying a particular behaviour selected ''Yes''.

The section pertaining to desire for oral health included two questions: ''Do you desire to be proficient at toothbrushing?'' and ''Do you desire your teeth to last for a long time?'' Agreement with these questions was indicated by selection of ''Yes''.

The section pertaining to subjective symptoms included eight questions corresponding to bleeding on brushing, biting pain, swelling of gums, widening of space between teeth, mobility of teeth, tooth pain associated with cold water, pain in the joint of the jaw and dry mouth. The presence of symptoms was signified by selection of ''Yes''. In the event an individual was unsure in terms of the presence of a particular symptom(s), ''Uncertain'' was chosen.

Patients were classified according to the answers for each item of the questionnaire. ''Uncertain'' was excluded from the data subjected to analysis. Percentage of patients continuing SPT was calculated by survival analysis. Survival analysis is often employed for tooth survival in dental research. This method is used for compliance with SPT consequent to the following rationale: Patients who continued SPT for a longer period of time should be treated differently than those who complied for only a short time following entry into the study. Survival analysis requires survival status and survival time at the appropriate point.

Whether patients continued to attend SPT appointments as of the end of July 2002 was examined; patients in attendance were assigned a score of 0, whereas patients not in attendance were assigned a score of 1. The number of visits was counted based on an electronic patient record for SPT. Ten visits correspond to approximately 5 years (average maintenance visits were scheduled at 6-month intervals). For survival analysis, the number of visits was referred to as the survival time; moreover, scores of 0 or 1 corresponded to ''alive'' or ''dead'', respectively.

Survival probabilities of SPT were estimated by the Kaplan–Meier method. Additionally, Kaplan–Meier curves were compared between answers of each item of the questionnaire via the Cox–Mantel test. Finally, a multivariate Cox proportional hazards regression model was constructed, which included age and gender as adjusting variables ($N = 161$). This step was performed as a result of our previous study (Ojima et al. 2001), which revealed that age and gender adjusted by age contributed significantly to compliance. The general form of the Cox proportional hazards model is given by the following equation:

$$\lambda(t) = \lambda \cdot (t) \exp(\beta x)$$

where β is a vector of regression coefficients corresponding to a vector of values given by x. The $\lambda(t)$ term corresponds to the ''baseline'' hazard (i.e., the hazard when x is a vector of zeroes). The hazard refers to the instantaneous probability of failure, given that a patient has continued SPT to that point. The term $\exp(\beta x)$ gives the relative risk, which corresponds to the multiplicative increase (or decrease) in baseline hazard for given values of x. The hazard ratio (HR) obtained from a Cox regression model takes into account the point in time at which a patient fails to comply with SPT.

The model in this study included only those variables characterized by HRs that remained constant over time. Constancy was verified by Kaplan–Meier curves. Furthermore, the model that displayed minimum Akaike Information Citation (AIC), which is a statistical criterion for model selection, was adopted. Variables related to desire with respect to oral health were excluded because of the insufficiently small number of ''No'' answers. These analyses were conducted with the StatFlex Ver 5.0 statistical package (Artec Inc., Osaka, Japan). Statistical significance was set at 5%.

Results

The distribution of patients is summarized by age and gender in Table 1. The age group 50–59 years exhibited the highest percentage (25.5%). The lowest percentage was observed in age groups 20–29 and 70+ years (10.9%). Gender distribution revealed a predominance of females.

Table 2 presents the distribution of patients according to answers to each item of the questionnaire. Patients generally displayed favourable attitudes, with the exception of the use of fluoride toothpaste. When subjects brushed their teeth and gums, 89% brushed the gingival margin carefully, whereas 56% used dental floss or inter-dental brushes. Approximately 60% of subjects had received tooth-brushing instruction at the initial visit. Most patients were former or never smokers. The majority of subjects desired good oral health. Nearly all patients answered ''I desire to be proficient at tooth-brushing'' (97.0%) and ''I desire that my teeth last for a long time'' (99.5%) in the affirmative. Subjective symptoms revealed the presence of slight to moderate periodontitis; 63%, 55% and 53% of patients complained of bleeding, swelling of the gums and widened spaces between the teeth, respectively.

Kaplan–Meier estimates of survival probabilities for those patients continuing SPT by study variables appear in Table 3. Overall survival probabilities at five and 10 visits were 67.7% and 52.7%, respectively. Patients characterized by unfavourable attitudes toward oral health exhibited a greater tendency to discontinue SPT in comparison with those displaying favourable attitudes. HRs of some variables (experience of toothbrushing instruction, smoking status, biting pain, swelling of gums and dry mouth) were not constant; namely, each Kaplan–Meier curve of the variables intersected. Patients who frequently consumed sugar-containing drinks were quite likely to abandon the SPT program relative to those individuals characterized by low consumption of these beverages ($p = 0.034$). No significant differences were observed in survival probabilities between the presence and absence of subjective symptoms.

Table 1. Distribution of patients by gender and age

Age range	No. of Patients		
	Total	Male	Female
– 29	47	26	21
30–39	81	32	49
40–49	57	18	39
50–59	110	23	87
60–69	89	35	54
70+	47	24	23

Table 2. Distribution of patients by answers to items of the questionnaire

	Answers	*n*	%
Attitudes toward oral health			
Do you brush carefully on the gingival margin?	Yes	311	88.9
	No	39	11.1
Do you use inter-dental brushes or dental floss?	Yes	185	44.3
	No	233	55.7
Do you use a fluoride toothpaste?	Yes	86	31.2
	No	190	68.8
Have you received toothbrushing instruction before?	Yes	250	58.3
	No	179	41.7
Do you frequently consume sugar-containing drinks?	Yes	266	62.4
	No	160	37.6
Do you smoke at present?	Yes	49	11.4
	No	382	88.6
Desire for oral health			
Do you desire to be proficient at toothbrushing ?	Yes	392	97.0
	No	12	3.0
Do you desire your teeth to last for a long time?	Yes	422	99.5
	No	2	0.5
Subjective symptoms			
Does it bleed when you brush your teeth?	Yes	259	62.7
	No	154	37.3
Does it hurt when you bite?	Yes	148	36.4
	No	259	63.6
Are your gums swollen?	Yes	208	54.7
	No	172	45.3
Do you feel spaces between your teeth widen?	Yes	186	53.0
	No	165	47.0
Is your tooth very loose?	Yes	66	17.5
	No	312	82.5
Does it feel sensitive when you consume cold drinks?	Yes	221	53.8
	No	190	46.2
Do you feel pain in the joint of your jaw?	Yes	80	19.6
	No	329	80.4
Is your mouth dry?	Yes	166	39.2
	No	257	60.8

Totals of less than 431 are the result of answers of ''Uncertain''.

Table 4 exhibits relative risk for low-compliance with SPT in a Cox Proportional Hazards Models by study variables. The model revealed that lack of careful brushing on the gingival margin (HR = 2.27), non-use of inter-dental brushes or dental floss (HR = 2.00), non-use of fluoride toothpaste (HR = 2.56) and frequent consumption of sugar-containing drinks (HR = 2.06) were significant independent prognostic factors for low-compliance with SPT ($p < 0.05$).

Discussion

This investigation involved multifactorial evaluation of prognostic factors for low-compliance with SPT employing a simple self-reported questionnaire at the initial office visit. We found that questions regarding attitudes toward oral health prior to treatment benefit clinicians in terms of prediction of compliance with SPT. Four attitudes toward oral health were established as significant independent prognostic factors for low-compliance with SPT, i.e., lack of brushing on the gingival margin, non-use of inter-dental brushes or dental floss, non-use of fluoride toothpaste and frequent consumption of sugar-containing drinks. These results suggested that those patients routinely practicing favourable behaviours prior to periodontal treatment exhibited a greater tendency to continue the SPT program in comparison with those who practiced unfavourable behaviours. The prognostic attitudes included factors pertaining to with caries prevention as well as periodontal health. Therefore, the over-

Table 3. Kaplan–Meier estimates of percentage of patients continuing SPT

		Survival probabilities		
		5 visits	10 visits	*p*
Overall		67.7	52.7	
Attitudes toward oral health				
Do you brush carefully on the gingival margin?	Yes	68.5	59.3	0.212
	No	58.5	n.a.	
Do you use inter-dental brushes or dental floss?	Yes	69.7	59.5	0.092
	No	63.7	56.9	
Do you use a fluoride toothpaste?	Yes	70.0	70.0	0.279
	No	63.5	50.5	
Have you received toothbrushing instruction before?	Yes	61.7	51.4	0.160
	No	72.2	52.7	
Do you frequently consume sugar-containing drinks?	Yes	63.2	44.3	0.034*
	No	71.9	69.0	
Do you smoke at present?	Yes	68.4	41.0	0.799
	No	66.4	57.9	
Subjective symptoms				
Does it bleed when you brush your teeth?	Yes	66.9	50.4	0.941
	No	66.3	60.8	
Does it hurt when you bite?	Yes	69.3	52.8	0.467
	No	63.7	56.6	
Are your gums swollen?	Yes	63.1	47.9	0.284
	No	70.3	n.a.	
Do you feel spaces between your teeth widen?	Yes	71.2	58.3	0.263
	No	65.3	38.3	
Is your tooth very loose?	Yes	68.9	68.9	0.742
	No	66.0	46.2	
Does it feel sensitive when you consume cold drinks?	Yes	64.2	53.2	0.178
	No	70.0	53.6	
Do you feel pain in the joint of your jaw?	Yes	63.7	n.a.	0.509
	No	67.5	53.9	
Is your mouth dry?	Yes	64.3	57.8	0.656
	No	68.0	49.0	

*Cox–Mantel test.
SPT, supportive periodontal treatment.

Table 4. HRs for low-compliance with SPT in Cox proportional hazards models ($N = 161$)

	HR	95% CI	*p*
Age (each 10 years)	0.76	0.60–0.95	0.016
Gender (female *versus* male)	1.73	0.86–3.50	0.125
Attitudes toward oral health			
Do you brush carefully on the gingival margin? (No *versus* Yes)	2.27	1.09–4.76	0.028
Do you use inter-dental brushes or dental floss? (No *versus* Yes)	2.00	1.03–4.00	0.041
Do you use a fluoride toothpaste? (No *versus* Yes)	2.56	1.09–6.25	0.032
Do you frequently consume sugar-containing drinks? (Yes *versus* No)	2.06	1.06–3.97	0.032
Subjective symptoms			
Does it bleed when you brush your teeth? (No *versus* Yes)	1.40	0.74–2.66	0.306
Do you feel spaces between your teeth widen? (No *versus* Yes)	1.30	0.68–2.46	0.431
Is your tooth very loose? (No *versus* Yes)	0.89	0.36–2.19	0.792
Does it feel sensitive when you consume cold drinks? (No *versus* Yes)	1.50	0.79–2.85	0.212
Do you feel pain in the joint of your jaw? (No *versus* Yes)	1.20	0.59–2.44	0.615

HR, hazard ratios adjusted by gender and age; CI, confidence interval.

all attitude toward oral health appeared to be as important as attitude toward periodontal health in compliance with SPT.

A main point with respect to improvement of compliance with general dental practice is not to expect major behaviour changes; rather, patients should be encouraged to implement a number of small changes over time (Blinkhorn 1993). Therefore, in cases involving individuals who do not display favourable attitudes at the initial visit, clinicians might attempt to help these persons alter these behaviours during APT. A number of small behavioural changes may enable patients to maintain compliance with SPT for extended periods. The popular assumption that effort directed at one behaviour will extend to others exists. Additional interventional research is necessary to confirm this assumption in terms of compliance with SPT.

More than 90% of our patients exhibited positive desire regarding proficiency at toothbrushing and lifelong retention of their teeth prior to periodontal treatment. However, overall survival probabilities of SPT were only 52.7% after 5 years. These results indicate that patients displaying favourable, positive beliefs do not always continue SPT program for extended periods. A patient tends to remain compliant in the long-term if he or she is compliant for the first 2 years of recommended maintenance therapy (Ojima et al. 2001). Accordingly, it is particularly important that patients comply with the first visit for SPT after APT, which may be ensured by improvement of motivation prior to SPT. The following should be emphasized prior to and during SPT: (1) SPT is necessary because of the potentially recurrent nature of periodontal diseases, (2) professional care as well as self-care is essential in order to maintain the health of teeth and gingiva.

Weakness of the present study may relate to the results derived from the questionnaire including limited factors. Models of health behaviour, such as The Health Belief Model (Kühner & Raetzke 1989, Barker et al. 1994), Self-esteem (Macgregor & Balding 1991) and Locus of Control (Borkowska et al. 1998), involve evaluation via a questionnaire that includes a number of items. The questionnaire employed in this investigation was originally designed to afford a brief estimate of patient history at initial visit. Questions regarding subjective symptoms, which may be beneficial for periodontal diagnosis or treatment, are inappropriate for prognosis of compliance with SPT. Moreover, whether patients comply with SPT appears to be influenced by factors associated with patients as well as with

clinicians. A more effective questionnaire for evaluation of factors related to compliance with SPT is required. Future studies should consider the effects related to improvement of compliance utilizing behavioural intervention on the basis of the outcome of the present investigation.

The results of this investigation suggest that questions regarding attitudes toward oral health at the initial visit lead to effective instruction with respect to improvement of compliance with SPT. Desire for good oral health is not related consistently to continuation of SPT. It is necessary to introduce a component into the periodontal treatment program corresponding to how patients reinforce their own behaviour. Changes in oral health behaviour such as toothbrushing may be a step toward establishment of compliance with SPT. Therefore, dental professionals should encourage patients to alter oral health behaviour in small steps during APT. Approaches involving the behavioural sciences may be essential for successful SPT.

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