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Author(s)	Ota, M; Seshima, F; Okubo, N; Kinumatsu, T; Tomita, S; Okubo, T; Saito, A
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Clinical Report

A Collaborative Approach to Care for Patients with Periodontitis and Diabetes

Mikio Ota, Fumi Seshima, Nobuki Okubo, Takashi Kinumatsu, Sachiyo Tomita, Takeshi Okubo* and Atsushi Saito

Department of Periodontology, Tokyo Dental College,
1-2-2 Masago, Mihama-ku, Chiba 261-8502, Japan
* Department of Internal Medicine, Tokyo Dental College,
1-2-2 Masago, Mihama-ku, Chiba 261-8502, Japan

Abstract

As periodontal disease and diabetes mellitus (DM) have bidirectional interactions, an effective approach to periodontal treatment for patients with diabetes in the clinical setting is essential. This paper reports an effort in collaborative care for patients with periodontitis and diabetes between dental and medical professionals, and provides a preliminary evaluation regarding the clinical outcomes. We have introduced a clinical pathway program at our institution applicable to patients with periodontitis and DM. Physicians and dentists utilize the clinical pathway to share medical and dental information in order to provide the optimal care for each patient. So far, this clinical pathway has been applied to the treatment of 50 patients. We analyzed clinical outcomes in 10 patients with the chief complaint of periodontal problems who had also been diagnosed with type 2 DM. After initial periodontal therapy and diabetes care, a significant improvement in the mean value of glycated hemoglobin and fasting plasma glucose was observed, accompanied by clinical resolution of periodontal parameters. Within the limitations of the present study, the results suggest that collaborative care between periodontists and physicians based on the clinical pathway is effective in glycemic control of patients with periodontitis and type 2 DM. This indicates the need for closer collaboration between medical and dental professionals in improving the management of these diseases.

Key words: Periodontal disease — Diabetes mellitus — Collaborative care

Introduction

Diabetes mellitus (DM) is a metabolic disorder characterized by chronic hyperglycemia due to the absence of insulin or its inability to function properly. It represents a public health problem due to its high prevalence, morbidity and mortality[2]. In Japan, 17.4% of men and 9.6% women over 30 years of age are considered at risk of developing diabetes[10]. The impact of DM and its complications, which include both macro- and microvascular diseases, on health is a major problem not only in Japan, but also globally[12].

Clinical studies have revealed that there is a higher incidence and severity of periodontal disease in both type 1 and type 2 diabetic patients compared with healthy individuals[4,9,11]. Periodontal disease is considered to be the sixth complication of DM[9]. Unlike other diabetic complications, periodontal disease and DM have bidirectional interactions[8,18]. Poor glycemic control aggravates periodontal disease, while periodontitis can affect glycemic control in diabetic patients. Therefore, an effective approach to periodontal treatment in patients with diabetes is essential in a clinical setting.

Clinical pathways are structured multidisciplinary care plans containing detailed essential steps in the care of patients with specific clinical problems[3]. They are often developed by translating guidelines into local protocols for application in clinical practice. Clinical pathways are currently emerging as a powerful tool in accomplishing a balance between efficient care and the high commitment to excellent medical care expected at academic medical institutions[5]. Currently, little information is available regarding the use of clinical pathways in the treatment of periodontal disease and DM.

After the implementation of the Medical Reform Bill in 2006, Chiba Prefecture initiated a coordinated inter-institutional program in 2008 aimed at providing a clinical pathway for the care of diabetes patients. In response to this initiative, a clinical pathway program was developed and introduced at Tokyo Dental College Chiba Hospital applicable to patients with periodontitis and DM. This paper describes an overview of the program and preliminary clinical outcomes based on the clinical pathway.

Methods

1. DM clinical pathway program

The clinical pathway of diabetes care used in Tokyo Dental College Chiba Hospital consists mainly of treatment planning and treatment process charts (Fig. 1). The clinical pathway

Fig. 1 Treatment process chart in DM clinical pathway

is used as a way to share medical and dental information and discuss treatment planning for each patient.

Diabetic patients are much less well informed regarding the risk for periodontal disease than that for other conditions[1], so brochures and posters were displayed in the hospital to increase awareness of the bidirectional relationship between periodontal disease and DM.

2. Patients

The clinical pathway was applied to patients who visited the Internal Medicine or Conservative Dentistry at Tokyo Dental College Chiba Hospital for the treatment of diabetes or periodontitis between August 2009 and February 2010. From among these, those with the chief complaint of periodontal problems were included in the data analysis. All the patients included had a clinical diagnosis of mild to moderate periodontitis[14]. Patients undergoing active periodontal treatment during the preceding 6 months, systemic or local

Table 1 Demographic characteristics of study population at baseline (n = 10)

Sex	
Men	7
Women	3
Mean age (years)	60.4
Age range	53–70
Glycemic status (HbA$_1$c; JDS)	
≥8%	10
<8%	0
Clinical parameters	
PD (mm)*	3.7 ± 0.9
BOP + (%)*	44.9 ± 18.1
PCR (%)*	58.0 ± 13.5

PD: probing depth; BOP: bleeding on probing; PCR: O'Leary plaque control record
*mean ± standard deviation
BOP + (%) = Number of BOP-positive sites/total number of surgical sites recorded

antimicrobial therapy during the preceding 3 months, or who were pregnant or lactating were excluded.

This retrospective study was approved by the Ethics Committee of Tokyo Dental College (No.379).

3. Procedure

After collection of full medical and dental histories, a periodontal examination was carried out. The periodontal parameters including probing depth (PD) and bleeding on probing (BOP) assessed at 6 sites of all teeth excluding the third molars. These were recorded at baseline and at each treatment period. Oral hygiene status was recorded using the plaque control record[13]. If a patient had, or was suspected of having DM (according to the results of a medical interview), a referral was made with the clinical pathway and treatment for DM was given by physician as needed. Only those patients with no severe diabetic complications or evidence of other systemic diseases that might affect periodontal tissues were included in the study. The patients were also monitored for systemic parameters including glycated hemoglobin (HbA$_1$c) and fasting plasma glucose (FPG).

As periodontal treatment, all patients received initial periodontal therapy consisting mainly of standard oral hygiene instruction, scaling and root planing by periodontists. For smokers, attempts were made to provide smoking cessation care. Based on the results at a re-evaluation performed 3 to 4 weeks after initial therapy, the patients were placed on supportive periodontal therapy (SPT).

4. Data management and statistical analysis

For the analysis of periodontal parameters or levels of glycemic control, a non-parametric Friedman Test and a post test were used to assess changes in quantitative data over time. A software package (InStat version 3.10 for Windows, GraphPad Software, La Jolla, CA, USA) was used. A p value of less than 0.05 was considered statistically significant.

Results

1. Patient demographics

Between its introduction and September 2011, the DM clinical pathway was applied to a total of 50 patients. Among these, 10 patients with the chief complaint of periodontal problems and a clinical diagnosis of type 2 DM were subjected to data analysis in this study. The demographic information of the study population is shown in Table 1.

Four patients were current smokers. Although efforts were made to provide smoking cessation care, none of them agreed to stop smoking.

2. Changes in glycemic control and periodontal parameters

The 10 patients had no prior experience of receiving DM treatment. Concurrent with periodontal therapy, they received DM care consisting mainly of anti-diabetic drugs (sulfonylurea agent and alpha glucosidase inhibitors) and instruction on diet and exercise.

Although the duration of initial periodontal therapy varied among patients, 4 to 8 months were required. After initial periodontal therapy, a decrease in the HbA$_1$c value was
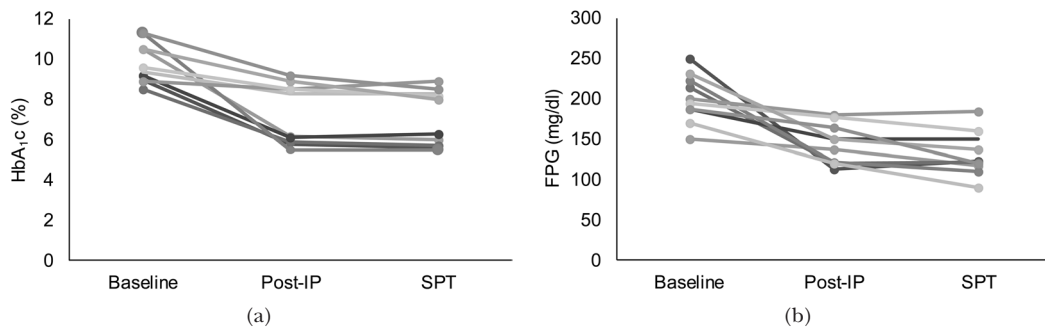
Fig. 2   Changes in glycemic control in patients who received DM and periodontal care (n = 10)
(a) HbA$_1$c (JDS), (b) FPG
FPG: fasting plasma glucose; Post-IP: after initial periodontal therapy; SPT: supportive periodontal therapy
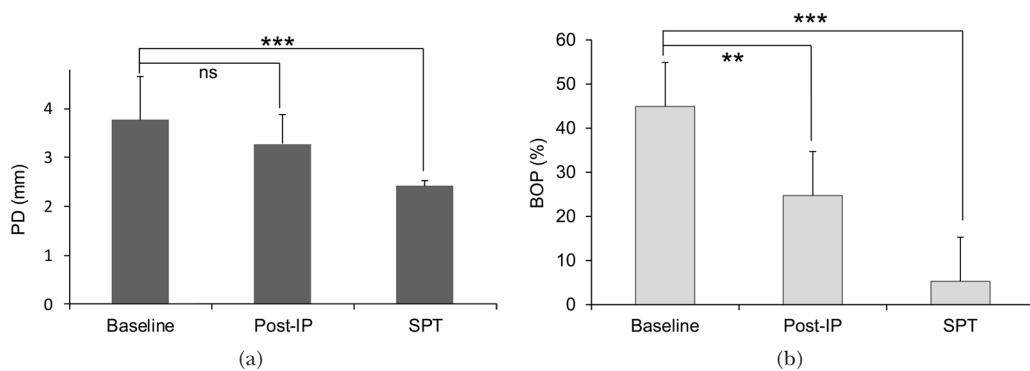

Fig. 3   Changes in periodontal parameters
(a) PD, (b) BOP
Data shown as mean ± standard deviations (** p<0.01, *** p<0.001, ns; not significant, Friedman Test with Dunn's Multiple Comparisons Test)

observed in all patients (Fig. 2a). The mean HbA$_1$c value at baseline (9.8 ± 1.0%) was significantly reduced to 7.3 ± 1.5% (p<0.05), and was sustained through SPT (7.1 ± 1.4%) (5 to 9 months from baseline). The HbA$_1$c values for 5 patients were less than 6.5% after therapy, which is considered to indicate control[6].

Likewise, a decrease in the FPG value was observed in all patients (Fig. 2b). The mean FPG value at baseline (200.9 ± 29.8 mg/dl) was significantly reduced to 143.5 ± 24.8 mg/dl (p<0.01), and was sustained through SPT (131.5 ± 27.4 mg/dl).

Although no statistically significant improvement in the mean PD value was noted after

therapy, it was significantly reduced during SPT (Fig. 3a). As for the mean BOP value, a significant improvement was observed after therapy and SPT (Fig. 3b).

Discussion

To the best of our knowledge, this report is one of the first to show the use of a clinical pathway in collaborative care for periodontal disease and DM. An improvement in the mean HbA$_1$c and FPG values was demonstrated in type 2 DM patients who received non-surgical periodontal treatment. This result is consistent with the findings of earlier studies[7,16]

suggesting the contribution of non-surgical periodontal therapy to glycemic control in DM patients.

A reduction in HbA_1c is important, as it is associated with a reduced risk for complications in diabetes[15]. For example, each 1% reduction in HbA_1c has been associated with a reduction in risk of 21% for any endpoint related to diabetes[17]. In the present study, the magnitude of improvement in the mean HbA_1c value (2.5%) was much greater than that (0.4%) reported in a meta-analysis[19]. It is difficult to compare data from the analysis of well-designed randomized controlled trials to that of an individual study with relevant limitations. Differences in periodontal or DM status, type of treatment, and the presence of confounders could affect treatment outcome. However, one possible reason for the relatively large improvement observed here may be the fact that those 10 patients had received no DM treatment before the start of the periodontal treatment. Therefore, it is speculated that the concomitant medical treatment for DM played a major role in the improvement in glycemic control.

It is important to note that the HbA_1c value was reduced to the control level (less than 6.5%) in only 5 patients. Due to the small size of the patient sample, we did not perform a statistical comparison of clinical status or other variables between those who experienced improvement in glycemic control and those who did not. A further large-scale study is needed to critically evaluate the effect of periodontal treatment or combined (periodontal and medical DM) treatments on glycemic control. Where the patient showed a high HbA_1c value, discussions were held between the dentist and the physician. Depending on the status of glycemic control, additional measures such as further diet control and exercise were implemented by the physician as necessary.

Smoking is a well-established risk factor for periodontitis and may be independently associated with pre-diabetes and type 2 diabetes[21]. In spite of our advice, 4 patients continued to smoke during treatment. Among

them, only one experienced an improvement in HbA_1c to below 6.5% after initial therapy. This indicates the need for greater effort to provide smoking cessation care in a clinical setting.

Collaboration between medical and dental clinical teams is necessary in the joint management of patients with periodontal disease and DM, and contact with dentists is important after a diagnosis of DM[15]. Within our subjective evaluation, the use of the DM clinical pathway facilitated communication between dental and medical professionals. Clinical pathways have been shown to be particularly valuable in large teaching hospitals[22]. The pathways dictate what will occur as the patient progresses through the treatment process[5,22]. As the clinical pathway involves all medical and dental personnel participating in the care of a patient, from the start of treatment to the maintenance period, we feel it significantly enhances the practice guidelines, which mainly focus on diagnostic and treatment[20]. As for the DM clinical pathway we utilized, the information on periodontal status and treatment process is very limited. This may not be a major problem as long as the clinical pathway is used within a single hospital, as the physician can easily refer to the periodontal or dental treatment process in the hospital chart. However, this would not be the case in interdisciplinary collaboration between hospitals, indicating the need for discussion on how the dental content of this pathway could be improved to allow this.

Moreover, we believe that communication based on the clinical pathway should extend beyond periodontists and physicians to nurses and dental hygienists. As health care professionals, it is necessary to provide well-coordinated and informed treatment for patients with periodontitis and DM. Closer collaboration between medical and dental professionals is necessary for the better management of patients with periodontal disease and DM.

There are obvious limitations to the present study. Since this was a small-scale retrospective study with no control group, no definitive

conclusion on the effectiveness of periodontal treatment on glycemic control, or vice versa, can be made. Moreover, the study design does not exclude the possibility that the improvement in glycemic control was achieved solely by the medical care for DM or other factors.

Within these limitations, the present results suggest that non-surgical periodontal treatment and DM care based on the clinical pathway exerts a positive effect on glycemic control in patients with periodontitis and type 2 DM. We believe that these results should prove useful in the design of future research aimed at evaluating the role of periodontal treatment in glycemic control of DM patients and the efficacy of the use of clinical pathways. Ultimately, these efforts should contribute to a better care for patients with periodontitis and DM.

Acknowledgements

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Reprint requests to:
  Dr. Atsushi Saito
  Department of Periodontology,
  Tokyo Dental College,
  1-2-2 Masago, Mihama-ku,
  Chiba 261-8502, Japan
  E-mail: atsaito@tdc.ac.jp