Visiting rate of dental clinic by the recommendation based on the periodontal screening tests for the patients with diabetes mellitus

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Purpose: The aim of this study was to investigate the dental visit status of patients with diabetes mellitus who needed to treatment of periodontitis screened by immunological salivary hemoglobin detection test (Perioscreen Sunstar) in the medical and dental clinic cooperation at community base.
Materials and Methods: The study population was patient with diabetes mellitus undergone periodontal screening tests by a family doctor, who is diabetologist in the internal medicine. In total, 100 subjects were selected. The dental visit status of the diabetes mellitus patients with positive results was investigated according to correspondence between the medical and dental information including intraoral clinical examination: number of remaining teeth, maximum value of the periodontal pocket and percent of bleeding on probing, and type of periodontal treatment.
Results: Fifty-seven patients were positive for Perioscreen Sunstar. Among the patients with positive results, 32 patients (56.1%) visited one of three partnership dental offices and all received periodontal treatment. Twenty-six patients (45.6%) were finished their periodontal treatment within 6 months. For the patients who finished dental treatment, parameters of periodontal diseases were improved.
Conclusion: About 60% patients with diabetes mellitus who regularly attend the medical clinic were positive for periodontitis by Perioscreen Sunstar. Among them, about 60% patients attended for dental clinic by the recommendation by family doctor. These results may provide the basic information to medical and dental clinic cooperation and community medical care networks.

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Key Words: diabetes mellitus, periodontal screening test, periodontitis

Introduction

Diabetes mellitus (DM) and chronic periodontitis are chronic inflammatory diseases that have been considered to be biologically linked [1,2]. Cross-sectional and longitudinal studies identified that the risk of periodontitis is approximately 3 to 4 times higher in people with diabetes than in non-diabetic subjects [3]. On the other hand, periodontal disease can aggravate insulin resistance [4] affect glycemic control [5]. Periodontal treatment improves glycemic control in type 2 DM [4]. By 2025, 300 million people are estimated to be afflicted with diabetes worldwide, with a prevalence of 6.4% [6,7].

In Japan, Medical treatment low stipulate every prefecture to design their own health care planning. In the health care planning, 5 diseases were focused: cancer, cerebral stroke, acute myocardial infarction, DM, and mental disease. For these diseases, community cooperated clinical pathway plays an important role. Community cooperated clinical pathway is a support system for the patients by sharing the information of the patients among the medical specialist, family doctor and variety of job descripted medical staffs. It aims at to provide safety and high quality medical treatment, implementation of support by medical team, optimization of comprehensive support, and saving medical resources.

As community cooperated clinical pathway is made by each community, variety of pathways are available.

Some of the community cooperated clinical pathways for the DM, dentist or dental clinics are included in the pathway. However, most of the medical doctor cannot diagnose periodontal disease. Recommendation of visiting dental clinic by without screening or examination may not effective to promote the motivation of patients. And there is no data available for evaluation of medical and dental cooperation at the community base.

In this study, we provided the tool of screening periodontal disease for the medical doctor and recommended for the patients with DM to visit the dental clinics based on the results of screening. We traced the patients for with or without visiting dental clinics to evaluate the medical and dental clinic cooperation at community base.

Materials and Methods

Study population

Study population consisted of the one hundred patients who attended at the Kato Clinic from November 1, 2017 to November 24, 2017. The patients were diagnosed as DM by the criteria of Classification and Diagnostic Criteria of DM [8]. Kato clinic specialized in internal medicine especially DM and is located north-east area of Tokyo. Patients with DM attended Kato clinic every month.

Clinical parameters of DM

Serum levels of HbA1c was measured by latex coagulating method.

Screening of periodontal disease

The patients rinsed with 3 mL distilled water for 10 s and expectorated into a 50 mL paper cup. The tail of immunological salivary hemoglobin detection test (Perioscreen Sunstar, Sunstar, Osaka, Japan) strip was placed into the cup and the color change was scored after 5 minutes. The color change due to the binding of human hemoglobin to its polyclonal antibody was evaluated [9,10]. The strip color was compared against the manufacturer's reference and assigned a score by two nurses simultaneously.

Medical and dental clinic cooperation

The patients with positive results of periodontal disease were given a letter of introduction to the dental clinic. The unification form of the data sheet of oral conditions and postage printed envelope to the medical clinic was enclosed with the letter of introduction. In the data sheet, number of remaining teeth, plaque control record (PCR), maximum value of the periodontal pocket, percent of bleeding on probing (BOP %) were recorded.

Statistical analysis

For the calculation of *p*-values by chi-square tests, Paired *t*-tests, Kruskal Wallis tests, Mann Whitney's *U* tests, or Wilcoxon signed-rank tests were performed by SPSS ver 24.0 (IBM, Tokyo, Japan).

Ethics

Informed consents were obtained from patients with DM prior to the Perioscreen Sunstar. This study was approved by the Ethics Committee of Tsurumi University School of Dental Medicine (No. 1414) and conducted in accordance with the Declaration of Helsinki.

Results

Among the one hundred patients with DM, 40 patients were more than 5 μg/mL, 17 subjects were 2 to 5 μg/mL and 43 were negative. For 57 subjects with more than 2 μg/mL were evaluated as positive for the Perioscreen Sunstar and recommended to visit the dental clinics. The results described above are shown in the diagram (Fig. 1). The characteristics of the patients with DM divided by results of Perioscreen Sunstar and compliance for the

visit of dental clinics. As shown in Table 1, statistically significant differences were not observed by the results of Perioscreen Sunstar in age, gender, BMI, HbA1c. And by the compliance of dental visit, statistically significant differences were not observed in age, gender, BMI and HbA1c (Table 2).

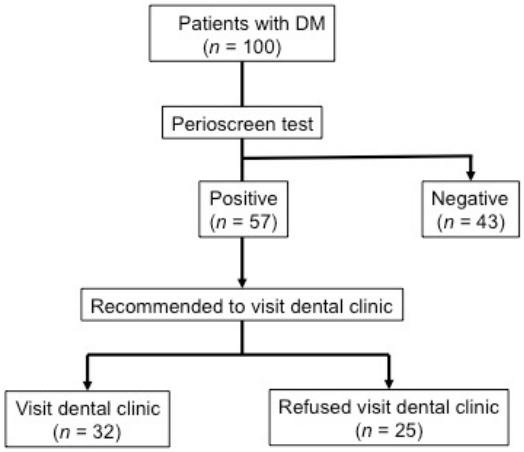

Fig. 1
Diagram of the compliance of visit to dental clinic Fifty-seven patients with DM were positive for Perioscreen Sunstar. Among the 57 patients positive for Perioscreen Sunstar, 32 patients (56.1%) visited dental clinics by the recommendation of physician.

Table 1 Characteristics of the patients participated in this study divided by the results of Perioscreen Sunstar

	Perioscreen Sunstar				*p*-value
	Negative (*n* = 43)	Positive			
		5 μg (*n* = 40)	2-5 μg (*n* = 17)	Total (*n* = 57)	
Age	61.0 +/− 11.5	63.2 +/− 10.9	65.5 +/− 11.0	64.8 +/− 10.9	0.128
Male/Female	28/15	24/16	4/13	28/29	0.528
BMI	25.6 +/− 4.1	25.2 +/− 5.4	24.5 +/− 3.8	24.7 +/− 4.3	0.487
HbA1c Baseline	6.9 +/− 0.7	7.1 +/− 0.7	7.2 +/− 0.8	7.1 +/− 0.8	0.232
HbA1c After 1 year	7.1 +/− 0.9	7.2 +/− 0.8	7.0 +/− 0.8	7.1 +/− 0.8	0.652

The *p*-values were calculated by chi-square tests or Kruskal Wallis tests.

Table 2 Characteristics of the patients divided by the compliance for visiting dental office

	Visited dental office (*n* = 32)	Refused to visit dental office (*n* = 25)	*p*-value
Age	66.4 +/− 8.6	63.0 +/− 13.5	0.407
Male/Female	20/12	8/17	0.266
BMI	24.1 +/− 3.2	25.7 +/− 5.6	0.368
HbA1c Baseline	7.1 +/− 0.7	7.1 +/− 0.8	0.843
HbA1c After 1 year	7.1 +/− 0.8	7.1 +/− 0.8	0.887
Perioscreen Sunstar 2-5 μg	12	6	0.304
Perioscreen Sunstar >5 μg	20	19	

The *p*-values were calculated by chi-square tests or Mann Whitney's *U* tests.

Table 3 Transition of the clinical parameters after dental treatment

		Mean values +/− SD	Median values (25%; 75% percentiles)	*p*-value
Number of remaining teeth	Before treatment	22.15 +/− 6.47	24.5 (21.0; 26.0)	0.066
	After treatment	21.85 +/− 6.64	24.5 (21.0; 26.0)	
PCR (%)	Before treatment	57.1 +/− 12.21	52.23 (48.50; 67.0)	<0.001
	After treatment	31.29 +/− 14.62	30.4 (16.0; 44.45)	
Maximum value of pocket depth (mm)	Before treatment	4.95 +/− 2.13	4.75 (3.50; 6.0)	0.012
	After treatment	3.98 +/− 1.44	4 (3.0; 5.0)	
BOP (%)	Before treatment	27.92 +/− 22.63	20 (9.00; 50.0)	<0.001
	After treatment	9.01 +/− 5.0	5 (0; 10.3)	
HbA1c	Before treatment	7.2 +/− 0.8	7.2 (7.0; 7.4)	0.987
	After treatment	7.2 +/− 0.9	7.2 (7.0; 7.4)	

Among the 32 patients who visited dental clinics, 26 were finished their periodontal treatment within 6 months. Clinical parameters of periodontal disease and DM were compared. Statistical difference between before and after treatment, calculated by the Wilcoxon signed rank tests

All of the patients visited the dental clinics needed to treatment of periodontal disease. Intraoral clinical examination data are shown in the Table 3. Periodontal treatment showed significant reductions ($p < 0.001$) of PCR, maximum value of periodontal pocket and BOP.

Discussion

In this study about 60% of patients with DM were positive for the Perioscreen Sunstar. By the National Survey of Dental Diseases in Japan [11], subjects with bleeding by probing is 52.0 to 59.3% for the age 40 to 74. These numbers were almost corresponded to our results.

In Japan three kind of periodontal screening tests are now available [9,12-15]. These tests were approved by Pharmaceutical Affairs Law as extracorporeal diagnostic agents. In these three tests, only Perioscreen Sunstar is a paper chromatography and the result of the test is obtained after 5 minutes [10]. Even though Perioscreen Sunstar is a simple and cost effective method, experienced examiner is necessary for the evaluation. And treatment of infective medical waste is necessary. Other two tests need to send saliva samples to the medical examination company and results are obtained by the numerical values. However, it takes at least 5 days. There are several merits and demerits are existed. In this study, we applied the Perioscreen Sunstar, because in the clinic, there are experienced examiner and patients need not to visit the clinic for only obtain the results of periodontal screening tests.

And the results of oral examinations by dentists demonstrated that PCR 57.1 +/− 12.21%, maximum value of periodontal pocket 4.95 +/− 2.13 mm and BOP % 27.92 +/− 22.63%. These cases were not moderate serious. The patients with DM were appropriately controlled by the treatment and health instruction. In fact, the levels of HbA1c were stable. It is well known that periodontal conditions are aggravated by the DM. Therefore, periodontal conditions of patients with DM were not so clear by complication of diabetes.

In this study, about 60% of patients with DM visited to three dental clinics. As far as we aware, only one data available for the visiting rate by post periodontal screening [16]. By the event style, subjects who answered to intended to visit dental clinic were more than 60% based on the results of periodontal screening test. However, this survey conducted by the questionnaire of posted mail style and recovery rate were around 20%. When simply compare the recommendation by periodontal screening tests, recommendation by the family doctor with screening tests were more effective to promote the visiting dental clinics.

In summary, the results that about 60% of patient with DM needed the periodontal treatment and then they did not visit dental clinics. And 60% of the patients who needed to periodontal treatment began to visit the dental clinic by the recommendation of their family doctor with the results of periodontal screening.

Even by the recommendation for visiting dental clinic by the family doctor, patients without subjective symptom usually do not visit dental clinic. This tendency may be applicable for the medical check-ups. Even by the simple screening tests, dental examination may facilitate visiting dental clinic. And results of this report may provide the basic information for medical and dental clinic cooperation and community medical care networks.

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