



A Middle-Aged Male with Type 2 Diabetes (T2D) and Periodontitis (PD) Persisting Inflammatory State for Years

Bando H^{1,2,3}, Ogawa T³, Okada M³, Iwatsuki N³ and Sakamoto K³

¹Tokushima University / Medical Research, Tokushima, Japan

²Japan Low Carbohydrate Diet Promotion Association, Kyoto, Japan

³Sakamoto Hospital, Higashi Kagawa city, Kagawa, Japan

*Corresponding author: Bando H, Tokushima University /Medical Research, Nakashowa 1-61, Tokushima 770-0943, Japan; E-mail: pianomed@bronze.ocn.ne.jp

Abstract

Current patient is a 42-year-old man who was diagnosed as type 2 diabetes (T2D) as HbA1c 10.6% in 2020. His stature was 110kg in weight and 37.8 kg/m² in BMI and treated by low carbohydrate diet (LCD). His status was improved for HbA1c 6.1-6.2% and weight reduction 10kg, but unstable HbA1c and dental periodontitis (PD) with inflammatory state persisted for years. His medical problems included hypertension, dyslipidemia, increased value of WBC. As pulse wave velocity (PWV), Cardio-Ankle Vascular Index (CAVI) was almost stable for 5.6-6.8, and ankle-brachial index (ABI) was improved from 0.99/0.96 to 1.17/1.10 (right/left) for 2 years.

Keywords: Type 2 diabetes (T2D); Low carbohydrate diet (LCD); Periodontitis (PD); Pulse wave velocity (PWV); Ankle-brachial index (ABI)

Commentary Article

Medical problems of type 2 diabetes (T2D) and obesity has been crucial [1]. General prevalence of obesity, overweight, and T2D have been evaluated until now, and it seems to be more than one-third across the world [2]. Furthermore, world patients of diabetes mellitus (DM) has been acutely increasing from 537 million to 783 million during 2021-2045 [3]. In those cases, clinical development of atherosclerotic cardiovascular disease (ASCVD) would become the inevitable cause of mortality and morbidity. Main goal for the diabetic important therapy could be the preventive direction for ASCVD and related diseases [4].

T2D has been understood for its complications of microangiopathy and macroangiopathy. The latter would lead to cerebral vascular accident (CVA), coronary artery disease (CAD) and peripheral artery disease (PAD). The aggravation of macroangiopathy can be prevented by remarkable weight reduction and continuing therapy of T2D. Basic treatment include indispensable nutritional treatment for DM. Formerly, calorie restriction (CR) was rather standard method for diet therapy, but

latest trend can show the predominance of low carbohydrate diet (LCD) [5,6]. LCD has been for itself proposed by doctors of Bernstein and Atkins in European and north American countries [7,8]. For health care and clinical regions, LCD has been accepted broadly. Authors and co-researchers have initiated LCD social movement by Japan LCD promotion association (JLCDPA). We informed LCD medically and socially of people through seminars, books, workshops and other beneficial chances [9,10]. For useful and simple measure, we proposed 3 kinds of practical LCDs, which are super-LCD, standard-LCD and petite-LCD. They include carbohydrate ratio as 12%, 26% and 40%, respectively [11].

On the other hand, previous standard data were observed about the mutual relationship between periodontitis (PD) and DM by a meta-analysis of cohort studies. As a result, 24% elevated PD are found in diabetic cases, and 26% elevated risk of DM in PD cases [12]. From the data of American Academy of Periodontology (AAP) and European Federation of Periodontology (EFP), those who with PD seem to develop T2D more as HR 1.19-1.33, than those without PD [13].

Received date: 03 August 2025; **Accepted date:** 15 August 2025; **Published date:** 21 August 2025

Citation: Bando H, Ogawa T, Okada M, Iwatsuki N, Sakamoto K (2025) A Middle-Aged Male with Type 2 Diabetes (T2D) and Periodontitis (PD) Persisting Inflammatory State for Years. SunText Rev Endocrine Care 5(1): 128.

DOI: <https://doi.org/10.51737/2771-5469.2025.028>

Copyright: © 2025 Bando H, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Authors group continued medical practice and research for ASCVD, and treated various kinds of patients. Recently, we happened to experience an impressive case with T2D, PD, obesity, with persisting positive inflammatory markers. After he was diagnosed as T2D, he was treated by LCD and oral hypoglycemic agents (OHAs). In this report, his general clinical progress and its related perspectives will be described.

Case Presentation

History and Physicals

Current patient is a 42-year-old man who did not have any special diseases before. When he was 37 years old, he was introduced to our diabetes department for further evaluation of diabetes in January, 2020. At that time, his HbA1c showed 10.6 % at the first contact.

Concerning his physical examination in 2020, he showed unremarkable findings of consciousness, speech, head, neck,

chest, abdomen and neurological situations. His vitals showed hypertension of BP 146/90 mmHg, pulse 72/min and normal respiration and SpO₂ saturation. His stature was 171cm, 110.6 kg, BMI 37.8 kg/m², in which it showed the 2-degree of obesity in the international category of obesity evaluation.

Several exams and diagnoses

Laboratory biochemistry showed some abnormal data, which are shown in Table 1. They include elevated liver function tests, dyslipidemia, increased values of WBC, Hb, RBC, and HbA1c. Chest X-ray and electrocardiogram (ECG) showed unremarkable. From mentioned above, the case was diagnosed with several life style-related diseases and Metabolic syndrome (Met-S). They include i) T2D, ii) obesity with BMI more than 35, iii) hypertension, iv) dyslipidemia, v) increased value of WBC, RBC and Hb.

Table 1: Progress of Biochemistry data.

	Units	2020		2021		2022		2023		2024	
		Jan	Jun	Mar	Aug	Mar	Aug	Jan	Aug	Feb	Oct
Liver											
AST	(U/L)	36	19	79	44	25	25	41	42	32	31
ALT	(U/L)	67	28	109	75	46	37	60	61	50	48
GGT	(U/L)	75	41	86	92	76	29	65	76	75	68
Renal											
UA	(mg/dL)	5.0	5.6	6.0	6.3	7.2	6.2	6.0	6.1	6.4	6.0
BUN	(mg/dL)	-	19	12	12	23	16	14	15	14	14
Cre	(mg/dL)	-	0.72	0.73	0.77	0.81	0.96	0.79	0.80	0.83	0.69
Lipids											
HDL	(mg/dL)	48	65	58	55	46	56	69	62	72	61
LDL	(mg/dL)	107	88	118	110	81	111	128	118	139	126
TG	(mg/dL)	528	247	178	313	1792	164	114	174	211	252
CBC											
WBC	(x10 ² /μL)	101	-	90	104	110	80	100	90	96	109
RBC	(x10 ⁴ /μL)	559	-	545	588	606	544	586	564	583	574
Hb	(g/dL)	16.2	-	15.4	16.8	17.6	15.2	16.6	16.0	16.6	15.9
PLT	(x10 ⁴ /μL)	22.0	-	20.1	22.6	24.1	22.9	25.2	24.3	24.6	26.7
Diabetes											
HbA1c	(%)	10.6	6.1	6.3	7.1	6.4	6.2	6.9	7.3	6.3	7.2
Immunol.											
CRP	(mg/dL)	-	-	0.59	0.39	0.54	0.22	0.51	0.43	0.49	0.34

During recent 5 years, changes in several blood biomarkers are summarized in Table 1. A pulse wave velocity (PWV) exam has been annually evaluated during 2022-2024 (Figure 1). The value of Cardio-Ankle Vascular Index (CAVI) were almost stable for 5.8-6.8 and 5.6-6.6 for right/left, respectively. PWV was compared between that of 2022 and 2024, in which ankle-brachial index (ABI) was improved from 0.99/0.96 to 1.17/1.10 during 2 years (Figure 2).

Abdominal CT scan was conducted for further evaluation of Met-S (Figure 3). Strong fatty infiltration was observed in the liver, and nodular high absorption was found on the edge of the lower pole of the right lobe of the liver, suggesting residual fatty liver. In addition, a ring-shaped stone with high density was noted near

the neck of the gallbladder, which is thought to be of mixed type. Fatty replacement and atrophy were also observed in the parenchyma of the pancreas, but no obvious swelling or inflammatory changes were observed. No significant changes were observed in the common bile duct or both kidneys. A diverticulum was found in the right colon.

Treatment and clinical progress

Among his medical problems, the most main therapeutic option was the rapid treatment for decreasing the hyperglycemia from T2D. Our diabetic team has taught him how to regulate his daily meal style, where LCD was basically necessary for the treatment. By LCD, he had 10 kg of weight reduction. For oral medication,

he has been provided for long in the following. They are valsartan 80mg, amlodipine besilate 5mg for hypertension, and metformin 500mg, teneligliptin hydrobromide hydrate 20mg, canagliflozin hydrate 100mg, voglibose 0.6mg for T2D, which are provided per day.

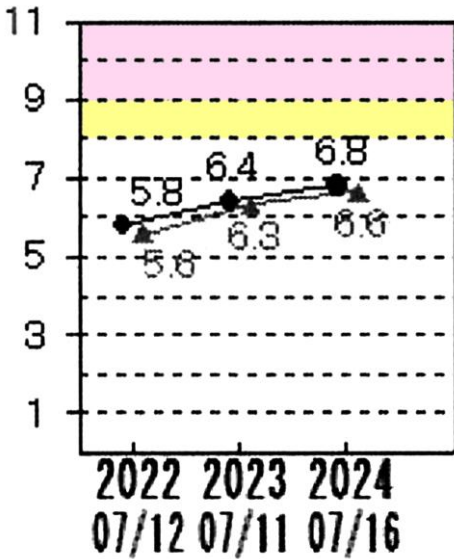


Figure 1: Changes in CAVI values for years CAVI showed stable in bilateral data.

By combination of various treatments, he showed stable HbA1c level during 2021-2022 with weight reduction about 10 kg until this period. However, his HbA1c and CRP increased again during 2023-2024 with stable body weight. Furthermore, clinically related clinical problem has persisted for long, which is unstable periodontitis (PD) for long, and he has occasionally visited dentist when he felt the exacerbated symptom of PD.

Ethical standards

The case was complied with the guideline of the Declaration in Helsinki [14]. The principle was along with ethical regulation for medical research. This guideline is from Ministry of Education, Culture, Sports, Science Technology and Ministry of Health, Labor and Welfare, in Japan. Authors established ethical committee in the hospital, which includes director, physician, nurse, pharmacist, dietitian, and legal professional. Our staffs discussed this protocol enough and agreed. Informed consent was taken by the patient.

Discussion

In this report, current case showed several clinical problems. They are i) T2D, ii) obesity, iii) hypertension, iv) dyslipidemia, v) increased values of WBC, RBC and Hb. Furthermore, other problems could be suggested, which are vi) fatty liver with lower ratio of AST/ALT, vii) persisting elevated value of CRP as

inflammatory situation, and viii) persisting dental problem as periodontitis (PD) for years. Among these factors, persisting inflammation may be involved in increased WBC (v), positive CRP (vii) and PD (viii) for long and they may exacerbate diabetic control so far. Mutual relationship between diabetes and PD has been known as vicious cycle [15].

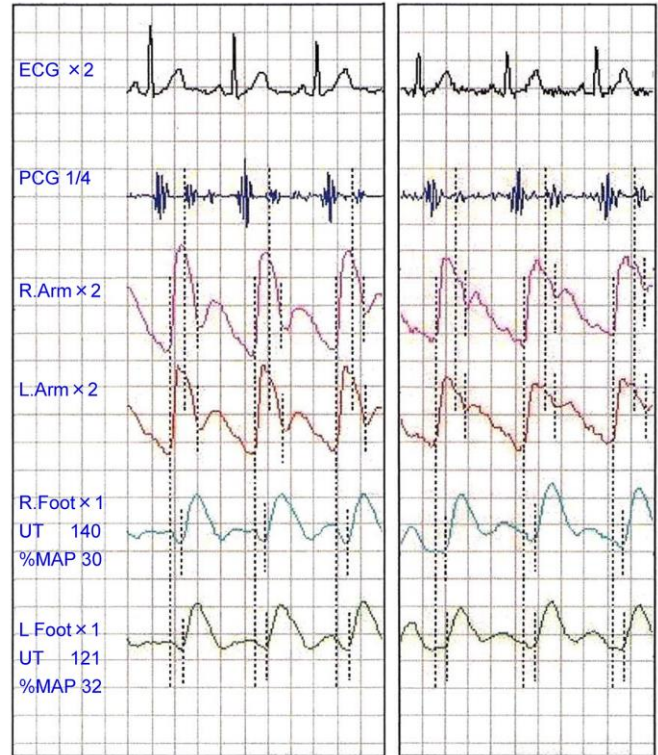


Figure 2: Changes in PWV during 2022 and 2024 ABI values were improved.

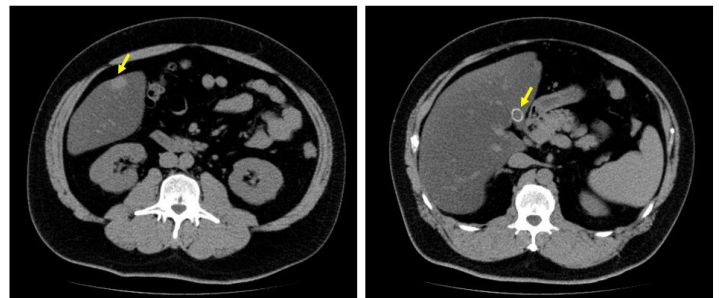


Figure 3: Findings of abdominal CT scan.
a. high density area in the liver suggesting strong fatty infiltration .
b. ring-shaped image by gall stone.

This case seems to have underlying obesity and developed T2D at middle age. The relationship between weight change and risk of developing T2D was evaluated [16]. A weight increase with >5% increased the T2D risk by more than 60%. On the other hand, a weight loss with >5% reduced the risk by more than 40%. For details, odd ratios (ORs) showed 1.58, 1.76, and 1.70 for 3-, 6-, 9-year follow-ups, respectively in multivariable analysis. Similarly,

weight loss $\geq 5\%$ showed 0.48, 0.57, and 0.51 for 3 period follow-ups.

The case showed 10kg of weight reduction by continuing LCD, which seemed to be satisfactory result. The latest RCT reviews for dietary interventions has revealed that LCDs consistently showed larger reductions in fasting glucose, HbA1c, triglycerides with superior weight loss with comparison with low-fat diets (LFDs) [17]. LCDs include very low-carbohydrate ketogenic (VLCK) diets, where it typically has less than 10% of total caloric intake from carbohydrates. Such super-LCD usually contribute greater results of reducing weight. From our medical group data, LCD contributed remarkable $>10\%$ weight reduction in 666 (24.0%) out of 2773 cases [18].

By evaluating the relationship among his medical history, clinical progress, symptoms, and laboratory data, unstable situation of PD may be related with the HbA1c value with certain inflammation. For the relationship of DM and PD, a systematic review and meta-analysis was reported as the latest data [19]. The inclusion criteria was required at least 3-6 months of follow-up, and 11 investigations met the criteria. As a result of dental treatment, significant reductions of HbA1c showed -0.64% for 3 months, and -0.33% for 6 months. Furthermore, CRP values showed significant decrease, suggesting the improvement in systemic inflammatory situation.

In order to enhance the health condition of patients with T2D and periodontitis (PD), clinicians have to manage the optimization of adjunctive therapies. The latest study showed the meta-analysis of 30 RCTs for short-term and medium-term with the statins/metformin influence to PD. As a result, adjunctive local therapy with statins or metformin showed significant improvement of PD [20]. This treatment showed superiority to root planning (SRP) and scaling with/without additional various interventions.

The latest report was to enroll 1223 cases from 14 studies for investigating positive efficacy of PD treatment on CRP value [21]. As a result, non-surgical treatment for PD has improved short-term inflammatory biomarker of high sensitivity-CRP for 0.39, while the treatment without antibiotics use was 0.34. As a large cohort study, the participants included T2D 251 thousands/non-DM 539 thousands and they were compared in the light of PD and other markers [22]. PD was found more in T2D for 22% than non-T2D for 17%. Its difference was larger in younger age cases. When adjusted relative ratio (RR) at the age of 30s, it showed 1.92 and exacerbated as glycemic control became aggravation.

Some limitation may exist in this report. Current middle-aged case showed T2D and periodontitis (PD), and these factors are involved in several diabetic complications. His diabetic control was good for some period, and worse for later period. By following up the future clinical progress, we will investigate

various biomarkers and factors that may influence the glucose variability and inflammatory situation.

In summary, 42-year-old male with T2D and PD was reported here with several related perspectives. Such case seems to be rather rare, and such clinical progress contribute detail pathophysiological influences of diabetic study in the future.

References

1. American Diabetes Association Professional Practice Committee. 4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes-2025. *Diabetes Care*. 2025; 48: S59-S85.
2. Leung LY, Tam HL, Ho JK. Effects of ketogenic and low-carbohydrate diets on the body composition of adults with overweight or obesity: A systematic review and meta-analysis of randomised controlled trials. *Clin Nutr*. 2025; 46: 10-18.
3. Siam NH, Snigdha NN, Tabasumma N, Parvin I. Diabetes Mellitus and Cardiovascular Disease: Exploring Epidemiology, Pathophysiology, and Treatment Strategies. *Rev Cardiovasc Med*. 2024; 25: 436.
4. Okamura T, Tsukamoto K, Arai H, Fujioka Y, Ishigaki Y, Koba S, et al. Japan Atherosclerosis Society (JAS) Guidelines for Prevention of Atherosclerotic Cardiovascular Diseases 2022. *J Atheroscler Thromb*. 2024; 31: 641-853.
5. Arsalandeh F, Shemirani F, Nazari MA, Mirmiran P, Golzarand M. Effect of low-carbohydrate diets on quality of life, mental health, and speed of memory in adults: a systematic review and meta-analysis of randomised controlled trials. *Int J Food Sci Nutr*. 2025; 76: 4-19.
6. Ichikawa T, Okada H, Hironaka J, Nakajima H, Okamura T, Majima S, et al. Efficacy of long-term low carbohydrate diets for patients with type 2 diabetes: A systematic review and meta-analysis. *J Diabetes Investig*. 2024; 15: 1410-1421.
7. Atkins and Robert. Dr. Atkins' New Carbohydrate Gram Counter. M. Evans and Company. 1996.
8. Bernstein RK. Dr. Bernstein's Diabetes Solution. Little, Brown and company, New York. 1997.
9. Wood M, Bando H, Ebe K. Immune Function Augmentation in Low-Carbohydrate Diet (LCD). *Int J Endocrinol Diabetes*. 2025; 8: 186.
10. Ebe K, Wood M, Bando H. In Memory of Dr. Richard K. Bernstein, April 17. *Int J Endocrinol Diabetes*. 2025; 8: 188.
11. Bando H, Ebe K. Beneficial and Convenient Method of Low Carbohydrate Diet (LCD) as Petite, Standard and Super LCD. *Asp Biomed Clin Case Rep*. 2023; 7: 1-4.
12. Stöhr J, Barbaresko J, Neuenschwander M, Schlesinger S. Bidirectional association between periodontal disease and diabetes mellitus: a systematic review and meta-analysis of cohort studies. *Sci Rep*. 2021; 11: 13686.
13. Graziani F, Gennai S, Solini A, Petrini M. A systematic review and meta-analysis of epidemiologic observational evidence on the effect of periodontitis on diabetes An update of the EFP-AAP review. *J Clin Periodontol*. 2018; 45: 167-187.



14. General Assembly of the World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *J Am Coll Dent.* 2014; 81: 14-8.
15. Ranbhise JS, Ju S, Singh MK, Han S, Akter S, Ha J, et al. Chronic Inflammation and Glycemic Control: Exploring the Bidirectional Link Between Periodontitis and Diabetes. *Dent J (Basel).* 2025; 13: 100.
16. Asgari S, Khalili D, Azizi F, Hadaeigh F. Weight change and risk of incident type 2 diabetes: short, medium and long-term follow-up in tehran lipid and glucose study. *Cardiovasc Diabetol.* 2024; 23: 207.
17. Anyang Kaakyire D, Abdelfattah OO, Kumar A, Qadeer S. Efficacy of Low-Carbohydrate Diets versus Low-Fat Diets in Glycemic Control among Patients with Type 2 Diabetes: A Systematic Review. *Cureus.* 2025; 17: e77004.
18. Nakamura T, Kawashima T, Dobashi M, Narita A, Bando H. Effective Nutritional Guidance for Obesity by Low Carbohydrate Diet (LCD). *Asp Biomed Clin Case Rep.* 2019; 2: 16-21.
19. Umezaki Y, Yamashita A, Nishimura F, Naito T. The role of periodontal treatment on the reduction of hemoglobinA1c, comparing with existing medication therapy: a systematic review and meta-analysis. *Front Clin Diabetes Healthc.* 2025; 6: 1541145.
20. Lin SY, Sun JS, Lin IP, Hung MC, Chang JZ. Efficacy of adjunctive local periodontal treatment for type 2 diabetes mellitus patients with periodontitis: A systematic review and network meta-analysis. *J Dent.* 2024; 148: 105212.
21. da Silva Barbirato D, Nogueira NS, Guimarães TC, Zajdenverg L, Sansone C. Improvement of post-periodontitis-therapy inflammatory state in diabetics: a meta-analysis of randomized controlled trials. *Clin Oral Investig.* 2024; 28: 514.
22. Trullenque-Eriksson A, Tomasi C, Eeg-Olofsson K, Berglundh T, Petzold M, Derks J. Periodontitis in patients with diabetes and its association with diabetes-related complications. A register-based cohort study. *BMJ Open.* 2024; 14: e087557.