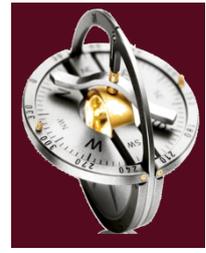


International Medicine

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Case Report

Significant weight reduction by super low carbohydrate diet with improved lipid profiles

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Received: 30 May 2020 / Accepted: 15 June 2020

Abstract

The case was a 41-year-old male patient with obesity and hypertension until 2015. He became 102 kg with body mass index (BMI) of 32.5 and HbA1c value increased to 6.6% in January 2016. Then, he started a low carbohydrate diet (LCD) and continued successfully. His body weight was decreased to 77 kg within nine months with 5.7% in HbA1c. His lipid profiles were improved as follows: triglyceride 143 to 33 mg/dL, LDL-C 130 to 102 mg/dL, HDL-C 40 to 76 mg/dL. After that, he has continued LCD but has always meals with excess calories. Then, his weight became 88 kg in January 2020 with 6.4% in HbA1c. During three years, values of HbA1c and lipid profiles became gradually worse. He has been prescribed for antihypertensive drugs and not for an oral hypoglycemic agent (OHA) so far. The adequate treatment would be discussed from now.

Keywords: carbohydrate, diet, Japan, non-communicable diseases

Introduction

Nowadays, non-communicable diseases (NCDs) have been prevalent including diabetes, dyslipidemia, hypertension and others worldwide. NCDs may give medical, social and economic influences to our lives [1]. For nutritional therapy for NCDs, Low Carbohydrate Diet (LCD) has been known in the medical and health care region [2]. Low carbohydrate diet was formerly begun by Bernstein and Atkins in Western countries [3,4]. The clinical efficacy of LCD was recognized and then LCD has been rather prevalent compared with Calorie Restriction (CR) [5].

In contrast, Dr. Ebe, our research collaborator, has initiated LCD in Japan [6]. Our research group has continued clinical research concerning diabetes, LCD and CR [7]. Beneficial effects of LCD have been reported such as meal tolerance test (MTT) of LCD and CR, an improved profile of blood glucose, an important role of ketone bodies, and others [8,9]. We have continued the social promotive movement of LCD by Japan LCD promotion association (JLCDPA) and informed people of practical three types of LCDs [9]. They are super-LCD, standard-LCD and petite-LCD, in which carbohydrate was included 12%, 26% and 40%, respectively [1].

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DOI:

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Among our clinical research, we have various patients with diabetes who revealed effective LCD treatment for a short period [10]. We have recently experienced an obese man who showed impressive clinical courses with decreased weight, improved lipid profiles and excess calorie intake of meals for years. In this article, the case is described in detail with some discussion.

Case

The case was a 41-year-old male patient in the year 2016. He was formerly in moderate physique with 177 cm in height, 72 kg in weight with 22.9 kg/m² in BMI when he was 20 years old. After that, his weight was gradually increased, and weight was 99 kg at 39 years old (2014). During 2014-2016, he was treated for hypertension. His physique showed 99-100 kg in weight, 104-108 cm in abdominal circumference, 31.6-31.9 in BMI and about 6.2 % in HbA1c, diagnosed as metabolic syndrome. After that, his weight was increased to 102 kg, and HbA1c value was increased to 6.6% in January 2016. Consequently, the case was introduced to the author for further evaluation and treatment of diabetes and obesity.

At first contact, his status and examination results were in the followings. His physicals showed normal consciousness and vitals including blood pressure, pulse and body temperature. No remarkable abnormality was detected in the heart, lung and abdomen. He did not reveal neurological abnormalities such as neuropathy. Furthermore, there were no diabetes-related symptoms such as retinopathy or nephropathy. At that time, his body weight was 102 kg with a BMI of 32.5.

The data of the laboratory tests on January 2016 for complete blood count (CBC) and biochemistry were as follows: Hb 15.3 g/dL, WBC 5800/μL, platelets 21.5x10⁴/μL, AST 26 U/mL, ALT 36 U/mL, r-GT 48 U/mL, BUN 14 mg/dL, creatinine 0.7 mg/dL, uric acid 7.2 mg/dL, triglyceride (TG) 143 mg/dL, LDL 130 mg/dL, HDL 40 mg/dL. Examination for peripheral artery disease (PAD) showed the following data: ankle-brachial pressure index (ABI) was 1.15 and 1.21 in right/left, respectively, and brachial-ankle pulse wave velocity (baPWV) was 1319 and 1296 in right/left, respectively. Those data were within normal limits. Abdominal echogram and CT scan showed a high degree of fatty liver, increased visceral abdominal fat and no other remarkable findings in the gall bladder, pancreas, kidneys. Chest X-ray and ECG were normal.

He had several medical problems. They included 1) obesity, 2) type 2 diabetes mellitus (T2DM), 3) hypertension, 4) hyperuricemia, 5) Gastro Esophageal Reflux Disease (GERD). His medication was summarized as follows: 1) valsartan (80) 1x1, amlodipine besylate (5) 1x1, 2) bisoprolol fumarate (5) 1x1, 3) febuxostat (10) 1x1, 4) lansoprazole OD (15) 1x1.

He started an LCD meal and completely avoided sugar-rich food. Then, his weight was decreased by 25 kg to 88 kg in nine months [Figure 1]. Lipid profiles were also examined along the clinical course. The changes in lipids between January 2016 and November 2016 were as follows: triglyceride 143 to 33 mg/dL, LDL-C 130 to 102 mg/dL, HDL-C 40 to 76 mg/dL [Figure 1]. Since November 2016, his diet pattern has changed a bit. As before, super-LCD had been continued with no changes for long. However, the meal situation has changed, in which the total calorie intake of the day has been increased much. As regards to his lifestyle, he has to work 5-6 days a week, and he is in charge of construction-related supervision. He has been always walking around all day long with persisting muscle activity.

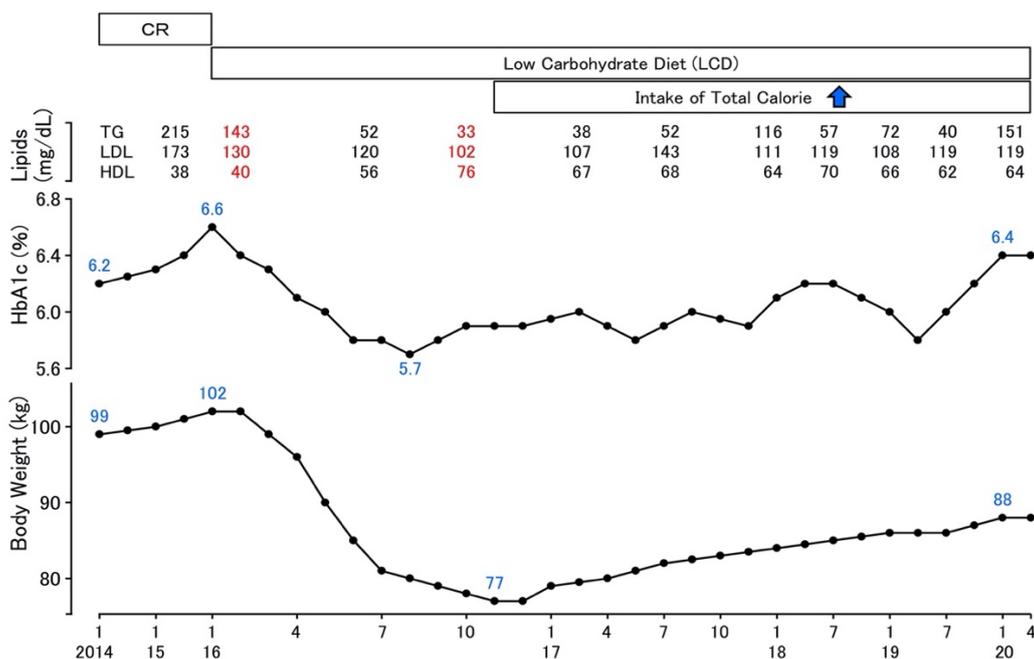


Figure 1. Clinical progress of the case with values of weight, HbA1c and lipids profile.

As he continued such lifestyle for three years, his weight gradually increased, HbA1c level gradually increased, and lipids profiles tended to be worse. In January 2020, his weight became 88 kg with HbA1c of 6.4%. During his clinical course, he has taken antihypertensive agents, but an oral hypoglycemic agent (OHA) has not been administered.

Discussion

Low carbohydrate diet has been gradually known in clinical practice settings. From basic medicine, its mechanism has been described in the biochemistry textbook in the following [11]. Animals have few defense mechanisms against elevated blood sugar, in which insulin is the only hormone that acts. In humans, 1 g of carbohydrates increases the blood glucose level of 1 mg/dL in healthy people, and 1 g of glucose increases 3 mg/dL in patients with type 2 diabetes [11].

The American Diabetes Association (ADA) stated in 2004 "Life with Diabetes" that carbohydrates were the only nutrient that raised postprandial blood glucose levels [12]. After that, ADA in 2008 presented the statement on the effectiveness of LCD [13]. The clinical effect for LCD was reported in the comparison study for LCD, Mediterranean, and low-fat diet (CR) [14], which became effective evidence in LCD. In European countries and the United States, the effects of the carbohydrate count method [15] and the Mediterranean diet [16] have been recognized to show clinical efficacy. Since then, clinical efficacy for LCD has been recognized widely in medical and health care regions.

This case has several characteristic and impressive aspects. As history, his BMI was 22.9 at the age of 20 but was 32.5 at 41 years with the first degree of obesity, and he has been originally hypertensive for years and taking medication. Regarding his compliance, his understanding and attitude toward LCD were excellent. His LCD achievement was satisfactory and perfect for nine months, obtaining a weight reduction of 25 kg to BMI of 24.6. Authors et al. have reported the clinical data of weight reduction by LCD in thousands of cases [17]. Among them, 25 kg reduction has been a significant level. He was not given OHA, because it was not necessary for his sufficient weight reduction and normalized HbA1c.

He has continued LCD for years with no rice, bread or noodles. The lifestyle of LCD was continued along with our proposed LCD food pyramid method [18]. However, his total daily calorie intake has been increased with gradual elevated weight and HbA1c. Though weight was increased, HbA1c was just in the border zone and did not deteriorate rapidly. This is probably because the intake of carbohydrates is minimal, which makes blood glucose and HbA1c to rise minimal. When his weight was increased to 88kg, HbA1c value became 6.4%. This may be due to partly decreased insulin secretion and partly increased insulin resistance. We plan to investigate the future treatment, whether he can reduce total calorie intake, change his lifestyle or take medicine for OHA.

As to the changes in lipid profiles, this case showed remarkable improvement in TG, HDL-C and LDL-C. Low carbohydrate diet has been known to have beneficial effects on TG and HDL-C [5,19]. On the other hand, the effect of LCD for LDL-C has been not consistent, where the value of LDL-C may be elevated, stable or decreased [5]. There is a trial of LCD score according to the percentage of energy from macronutrients, plant-based and animal-based data [20]. In a recent report, there was a treatment of LCD (less than 30 g of carbohydrate a day) for three months [21]. It revealed the following data: weight 85.7 to 76.7 kg, HbA1c 8.9% to 5.6%, TG 177 to 92.1 mg/dL, TG/HDL ratio 4.7 to 1.9 [21].

In summary, the case with obesity and diabetes showed 25 kg of weight reduction by LCD, associated with improvement of blood glucose, HbA1c and lipid profiles. Successively, LCD and increased intake of total calories have brought elevation of weight and HbA1c. These data are expected to serve as a reference for future diabetic research.

Conflict of interest

The authors declare no conflict of interest.

Funding

No financial support was provided for this study by any sponsoring organization or any for-profit product companies.

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