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Commentary

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Beneficial and Convenient Method of Low Carbohydrate Diet (LCD) as Petite, Standard and Super LCD

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Abstract

For type 2 diabetes (T2D), the recommended meal has shifted from calorie restriction (CR) to a low carbohydrate diet (LCD). LCD gained worldwide prevalence through the efforts of Atkins and Bernstein, and we further developed LCD both medically and socially through the Japan LCD Promotion Association (JLCDPA). The beneficial and convenient methods of LCD include petite, standard, and super LCD, which have carbohydrate ratios of 40%, 26%, and 12%, respectively. For these three types, the approximate permitted carbohydrate amounts in each meal appear to be 20g, 30g, and 40g. Some foods with lower carbohydrate content include eggs (0.1g), a piece of cheese (0.2g), chicken meat (180g) (0.4g), and Japanese tofu (300g) (4g).

Keywords

Low-Carbohydrate Diet, Super-LCD, Japan LCD Promotion Association, Ketone Bodies, Mean Amplitude of Glycemic Excursions

Abbreviations

LCD: Low-Carbohydrate Diet; JLCDPA: Japan LCD Promotion Association; MAGE: Mean Amplitude of Glycemic Excursions

In recent years, type 2 diabetes (T2D) and obesity have become crucial problems from medical, social, and economic points of view [1]. The former standard nutritional treatment for adequate weight control in T2D was calorie restriction (CR). However, low carbohydrate diet (LCD) has been evaluated for controlling applicable body weight for some decades [2]. Historically, LCD was initiated by two well-known doctors, Atkins and Bernstein, in North American and European areas [3,4]. They have provided evidence of the clinical efficacy of LCD, and various reports have supported its satisfactory effects [5].

On the other hand, the author and collaborators initiated LCD in Japan [6]. We have spearheaded various movements in LCD through the Japan LCD Promotion Association (JLCDPA) in the medical and health care regions [7]. The fundamental evidence for LCD arises from the fact that the oral intake of carbohydrates leads to post-prandial elevation of blood

glucose, a well-known aspect of glucose metabolism and basic biochemical information [8]. When 1g of carbohydrate is ingested orally, the resulting increase in glucose levels is 1mg/dL for healthy individuals, 3 mg/dL for T2D patients, and 5 mg/dL for type 1 diabetes (T1D) patients [9].

Among the various activities of JLCDPA, we have introduced three useful and convenient types of LCD methods. They are petite LCD, standard LCD, and super LCD, in which the carbohydrate amounts are included as 40%, 26%, and 12% of the calorie involvement ratio, respectively [7]. In Japan, we previously recommended a standard CR meal for T2D, which had 50-60% of carbohydrate content. This was inadequate for blood glucose control in T2D. The commonly popular diet therapy for T2D recommended 1400 kcal per day for CR. In the case of super-LCD, where 12% of the diet consists of carbohydrates, this means 1400 x 0.12 = 168 kcal of carbohydrate intake per day. When divided by 4 kcal/g of carbohydrate, super-LCD includes 42 g of carbohydrate per day in total for breakfast, lunch, and supper [10]. For reference, the general tendency of the three main nutrients and calorie content for CR, petite, standard, and super LCD can be understood from **Fig-1**. Super-LCD includes lower carbohydrate content and higher fat content, which can be fully tolerated by T2D patients, individuals with obesity, and in various other situations.

To understand and maintain adequate LCD meals every day, several references have been prepared for patients with T2D, atherosclerotic cardiovascular diseases (ASCVDs), and non-communicable diseases (NCDs) [11]. Every meal requires some limitation of carbohydrate content, accompanied by correct information in terms of nutrition. The approximately permitted carbohydrate amounts in each meal seem to be 20g, 30g, and 40g in super, standard, and petite LCD [10]. According to each person's lifestyle and health concerns, individuals can choose to follow either method of LCD. A simple way to continue with petite LCD would be to avoid carbohydrates in one meal out of the three meals in a day. For example, one can consume carbohydrates in breakfast and lunch, whereas they can opt for no carbohydrates in the supper.

Some recommendations are provided for starting and continuing a successful LCD. Each food has a certain amount of carbohydrate, and representative foods are highlighted in educational seminars. For example, foods with lower carbohydrate content typically include 0.1g of egg (50g), 0.2g of cheese piece (20g), 0.4g of chicken meat (180g), 4g of Japanese tofu (300g), and 8g of beans (100g) [10] (**Fig-2**). When a patient begins to adopt an LCD meal, the

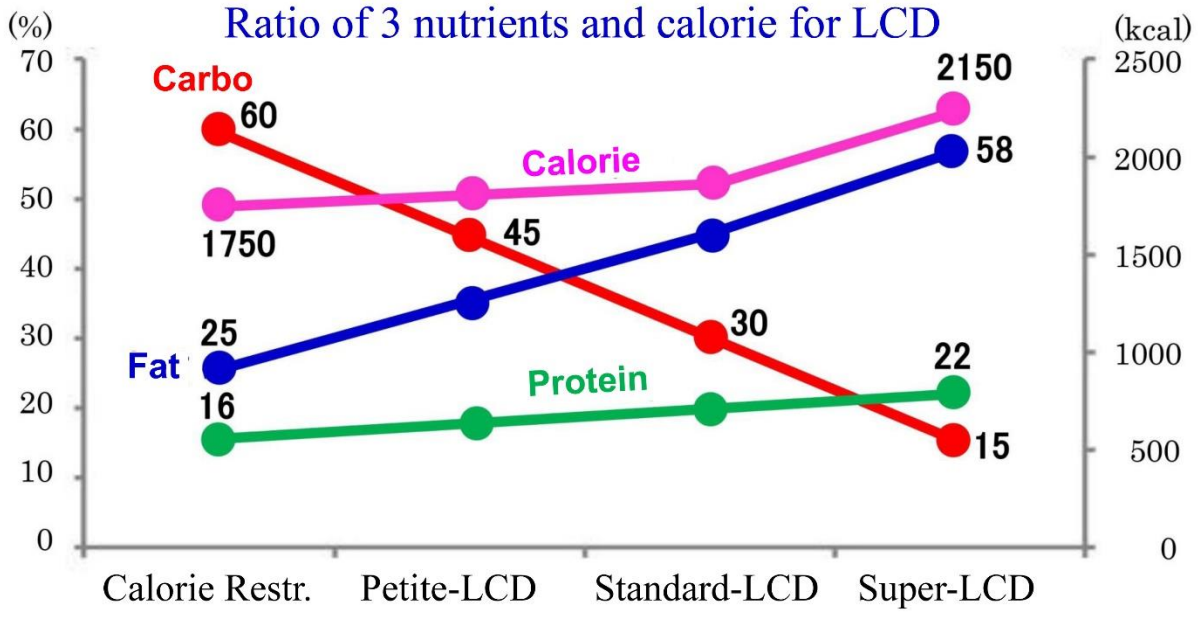

Fig-1: The Ratio of Three Main Nutrients and Calorie for LCD

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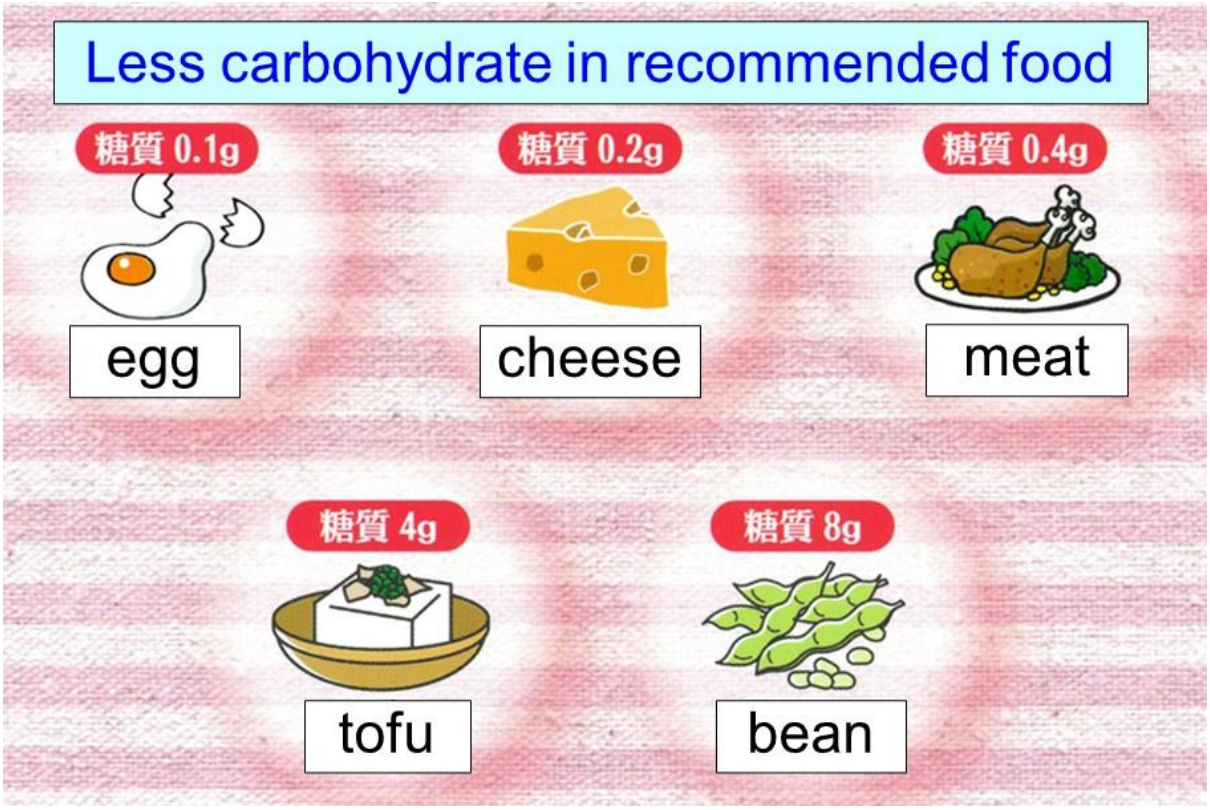

Fig-2: Recommended Some Foods with Less Carbohydrate Amount

recommended order for consuming various dishes is as follows: i) start with a salad with oily dressing, ii) intake animal meat, fish meat, or eggs for protein, iii) consume some liquids that do not contain sugar or carbohydrates, iv) avoid foods with high carbohydrate content, such as bread, rice, pasta, and others [12].

As a matter of fact, LCD can be applied to in-patients with T2D in the hospital setting, where three meals contain fewer carbohydrates to educate about actual daily lifestyle [13]. After becoming accustomed to LCD meals apart from the previous CR meal, T2D patients usually experience reduced sensations of hunger. This is because the mean amplitude of glycemic excursions (MAGE) is consistently reduced, leading to mental stability throughout the day. The detailed definition of LCD has not been clearly established yet. However, Feinman et al. have provided guidelines for defining LCD based on carbohydrate ratio and/or amount/day in a typical daily meal [14]. They include four categories as follows: i) High carbohydrate (45%<), ii) Moderate carbohydrate (26-44%), iii) Low carbohydrate (<26%) and/or < 130 grams of carbohydrate per day, iv) very low carbohydrate (< 10% carbohydrate) and/or 20-50 grams per day.

In summary, LCD appears to demonstrate efficacy for glucose control, weight reduction, and other effects arising from hyperketonemia, such as anti-inflammatory and anti-oxidative efficacy [15]. This article serves as a hopefully valuable reference for clinical metabolism and diabetes.

Conflict of Interest

The authors have read and approved the final version of the manuscript. The authors have no conflicts of interest to declare.

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