Dietary Management of Epilepsy

Dietary management is an alternative treatment for children with intractable epilepsy\(^1\). New researches indicate that adults may also benefit from dietary management\(^2,3\). The traditional ketogenic diet, the ketogenic diet with medium-chain triglycerides, the modified Atkins diet, and the low glycemic index treatment are all alternatives of dietary management for epilepsy\(^4,5\).

To date, the exact mechanism of the ketogenic diet in reducing seizure activity is still unknown\(^1\). The goal of dietary therapy is to mimic the biochemical changes of the body during fasting. By reducing the number of carbohydrates intake during the dietary therapy, the body is forced to burn fat for energy, a process called ketosis. This ketosis is the same process that kicks in when someone is fasting. Fasting has been a traditional seizure treatment for some time\(^1\). In the animal model, the ketogenic diet diminishes synaptic excitability by decreasing excitatory neurotransmitter release from presynaptic neurons\(^6\). As a result, it blocks the transmission of epileptic impulses in the brain.

**Traditional Ketogenic Diet**

The traditional ketogenic diet (KD) is high in fat and low in carbohydrates with adequate protein. The ratio of fat to protein and carbohydrate is 3:1 or 4:1\(^4\). When initiating the KD, patients are required to fast for 24 to 48 hours, and then gradually introduce the KD over several days\(^7\). The brief fasting period is used to boost their serum ketone level quickly. During fasting, their body will use up the glucose that is stored in muscle and liver. After 24 to 48 hours, glucose stores are used up and both lipolysis and ketone production begins\(^9\). Christina Bergqvist et al. (2005)\(^8\) argued that fasting before the initiation of the KD is not required. Gradual initiation of the KD is tolerated better by the patients, achieved the same seizure control of the KD, and with fewer adverse events such as hypoglycemia, dehydration, acidosis, and weight loss.

According to Neal et al. (2008)\(^1\), children with intractable seizures who were put on the KD had significantly reduced seizure activity. At follow up after the three months, it was found that 7% of children had a 90% reduction and 38% of children had more than a 50% reduction. On the contrary, disadvantages of the KD include the restriction of calories and fluid intake and the need to weigh all food\(^9\).

**Medium-chain Triglyceride Ketogenic Diet**

Modification of the ketogenic diet by using medium-chain triglycerides (MCT) for the fat source was introduced in the 1970s\(^1,5\). Medium-chain triglycerides produce more ketones per kilocalorie of energy than the long-chain triglyceride used in the traditional ketogenic diet. Therefore, less total fat is required and more carbohydrate and protein can be consumed\(^1\). The KD with MCT is more tolerable than the traditional KD because of the reduced fat content. The effectiveness in seizure control between the traditional KD and the KD with MCT are similar\(^10\).

**Modified Atkins Diet**

A third alternative of dietary management for epilepsy is the modified Atkins diet (MAD). The MAD is a more palatable and less restrictive diet in comparison to the ketogenic diet. It involves no restriction on protein, calories, or fluid intake. The MAD has a 0.9:1 fat to carbohydrate and protein ratio\(^11\). Six months after children with intractable seizures were put on the MAD, 65% of children had >50% seizure reduction and 35% had >90% reduction. Researchers also found that increasing carbohydrate in the MAD did not worsen seizure control\(^9,11\).

**Low Glycemic Index Treatment**

Another alternative of dietary management is the low glycemic index treatment (LGIT). Glycemic index (GI) is a measure to assess the increase of blood glucose levels after consumption of a carbohydrate-containing food\(^12\). Glycemic index is affected by different factors such as the particle size, type of starch, starch gelatinization, presence of fat, acidity, and fiber content\(^7\). The higher the GI, the greater the increase in blood glucose levels after ingesting the food. Total caloric intake is calculated based on an individual's needs. The LGIT diet consists of 60% fat, 20-30% protein, and 40-60gm carbohydrate per day. All carbohydrate containing foods must have a GI <50. With the LGIT, foods are calculated in portions and fluid intake is encouraged\(^7\).

**Adverse Effects and Disadvantages of the Dietary Therapies**

There are a number of adverse effects when following the dietary management. These include constipation, vomiting, lack of energy, diarrhea, abdominal pain, taste alterations, metabolic acidosis, renal calculi, poor growth, increase in total...
cholesterol and blood urea nitrogen (BUN), and other metabolic abnormalities\textsuperscript{1,4,8,11,13}. Other disadvantages of using dietary management for seizure control are, it requires commitment of the patient, it can be quite time consuming, as well, there needs to be extensive involvement and support from the health care professional such as dieticians, physicians, and families\textsuperscript{2,4}. Lastly, it is more expensive and difficult to prepare the KD compared to a regular diet\textsuperscript{3}.

Some countries in South East Asia, where the main components of the diet are rice and noodles which consist of a high percentage of carbohydrate compared to fat and protein. Using the Atkins diet with a lower fat to carbohydrate and protein ratio may be an alternative to patients with intractable seizures in these countries\textsuperscript{14}. It is also important to note that supplements such as multivitamins, calcium, and vitamin D are required when patients are on the dietary therapies\textsuperscript{13,15}.

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**Reference**


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