

# Recipe modification in two cases with the ketogenic diet related hyperlipidemia

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## Introduction

The ketogenic diet (KD) is an alternatively effective treatment in patients with medically intractable epilepsy. The classic KD contains more than 80% calories from fat. Hyperlipidemia is one of the common adverse effects during the administration of the KD. Here we reported two cases who received classic KD with diet related hyperlipidemia, which improved after recipe modification.

## Methods

Two cases experienced intractable epilepsies and received the classical KD for treatment. Before the diet, both showed normal lipid profiles. However, diet related hyperlipidemia was found during the regular follow-up of laboratory tests. They were transferred for nutrition consultation.

## Results

The diet modification should reduce intake of saturated fats and increase intake of fiber to improve lipid profiles. To reduce saturated fats intake, food like skinless chicken breast, lean beef, lean pork, fish were suggested. To increase fiber intake, more vegetables intake were suggested, especially rich with gelatin.

Because the classic KD contains more than 80% calories from fat, the choice of cooking oils is very important. The cooking oils containing more monounsaturated fatty acid or omega 3 fatty acid like linolenic acid can help to prevent hyperlipidemia. Omega 3 fatty acid is included in polyunsaturated fatty acid. Lard containing more saturated fatty acid and grape seed oil containing more polyunsaturated fatty acid are not suggested for the KD. Olive oil and camellia oil containing more polyunsaturated fatty acid are suggested for the KD. Linseed oil and perilla oil containing more linolenic acid are also suggested for the KD. Regarding the cooking oils, the two patients used olive oil at first, and they were suggested to shift to camellia oil or linseed oil. Camellia oil contains more monounsaturated fatty acids than olive oil, and linseed oil is rich in omega 3 fatty acids (TABLE1).

One patient(case1) changed to use olive oil plus linseed oil, and the other(case 2) changed to use camellia oil. After 3 months of the recipe adjustment, the two patients showed improving lipid profiles (TABLE2).

TABLE 1 Comparison of fatty acid composition in six cooking oil

	Saturated fatty acid (%)	Monounsaturated fatty acid (%)	Polyunsaturated fatty acid (%)	Linolenic acid (%)
Lard	39.34	44.50	16.17	0.79
Grape seed oil	11.42	18.58	70.00	0.25
Olive oil	16.30	74.30	9.40	0.66
Camellia oil	10.53	82.51	6.96	0.28
Linseed oil	9.70	16.36	66.58	53.44
Perilla oil	7.70	14.60	77.10	62.00

TABLE 2 Lipid levels before the KD and before and after diet modification

	TC (mg/dL)	HDL (mg/dL)	TG (mg/dL)	LDL (mg/dL)	TC/HDL
<b>CASE1</b>					
Before the KD	205		91		
Before diet midification	216	62	74	138	3.5
After diet modification	200	50	87	134	4.0
<b>CASE2</b>					
Before the KD	185		56		
Before diet midification	244	65	46	154	3.8
After diet modification	190	64	44	121	3.0

## Conclusions

The KD related hyperlipidemia could be resolved by modification of food resources and choosing different cooking oils. These need more studied to know that which cooking oil may improve diet related hyperlipidemia more.