

EFFECT OF COOKED FOOD WITH STIR-FRIED OLIVE OIL OR NOT ON ERYTHROCYTE MEMBRANE FATTY ACID CONTENTS IN HEMODIALYSIS PATIENTS

Da Ye Yoon, Su Mi Lee, Young Ki Son, Seong Eun Kim, Won Suk An
Internal Medicine, Dong-A University, Busan, Republic of Korea

Background

◆ Hemodialysis (HD) patients had higher mortality rate caused by cardiovascular disease and high oleic contents of erythrocyte membrane compared to general population

[Zoccali C, *Kidney Int* 2006;70:26-33]
[An WS et al, *Nutr Res* 2012;32:495-502]

◆ Olive oil, one of Mediterranean diets, may be helpful for reducing risk of cardiovascular disease

[Estruch R et al, *N Engl J Med* 2013;368:1279-1290]
[Marchioli R, *Lancet* 1999;354:447-455]

◆ However, there is no study about the effect of olive oil as a cooked food on erythrocyte membrane fatty acid (FA) contents in HD patients

◆ The purpose of this study is to know whether taking meals with olive oil effect on erythrocyte membrane FA contents in HD patients. In addition, we tried to find the differences of FA contents according to stir-fried olive oil or not.

Methods

◆ This single blinded randomized clinical trial enrolled 31 HD patients in a single Center.

◆ We selected 6 kinds of menu with properly restricted diet for HD patients and supplied food as a lunch meal, 3 times per week, at HD day

◆ Ten grams of extra virgin olive oil was used for each lunch. Lunch meal was stir-fried with olive oil in one group. In the other group, olive oil was just mixed into meal without stir-frying.

◆ We checked eaten amount of lunch and evaluated dietary questionnaire at baseline and after 12 weeks

◆ Erythrocyte membrane FA content was measured by gas chromatography at baseline and after 12 weeks

Results

Table 1 Baseline characteristics and changes in biochemical data

	Not stir-fried olive oil		Stir-fried olive oil	
	Baseline	12 weeks	Baseline	12 weeks
Age (years)	58.0±12.1		59.1±12.7	
Male, n (%)	7 (50.0)		5 (38.5)	
Diabetes mellitus, n (%)	12 (85.7)		7 (53.8)	
Duration of dialysis (months)	62.3±39.4		63.4±46.6	
Amount of intake	0.87±0.13		0.85±0.18	
Body mass index (kg/m ²)	22.7±3.6	22.6±3.5	21.5±2.9	21.3±3.0
Glucose (mg/dL)	163.6±150.8	175.3±109.4	145.7±92.5	101.4±56.5*
Glycated hemoglobin (%)	8.3±1.5	8.2±1.2	9.4±2.8	8.2±2.0
Hemoglobin (g/dL)	10.9±1.0	10.9±1.2	11.3±1.0	10.8±1.1
Calcium (mg/dL)	9.1±0.6	9.1±0.5	9.3±0.6	9.3±0.8
Phosphorus (mg/dL)	5.1±1.3	5.6±0.6	5.2±1.3	5.1±1.6
Blood urea nitrogen (mg/dL)	65.6±20.9	77.6±19.5	73.7±16.3	69.0±19.0
Creatinine (mg/dL)	11.4±3.0	11.8±3.2	11.5±1.9	11.3±2.2
Glomerular filtration rate (ml/min/1.73m ²)	4.6±1.3	4.4±1.0	4.1±0.5	4.3±0.6
Total protein (g/dL)	7.3±0.5	7.5±0.6	7.2±0.6	7.3±0.7
Albumin (g/dL)	4.0±0.2	4.1±0.1*	3.9±0.3	4.0±0.4
Total Cholesterol (mg/dL)	162.5±60.7	153.2±43.5	163.4±45.9	152.7±43.3
Triglyceride (mg/dL)	259.4±273.2	185.6±124.2	168.5±104.1	139.5±90.1
High-density lipoprotein cholesterol (mg/dL)	40.2±10.9	38.0±10.5	43.1±10.9	42.8±11.8
Low-density lipoprotein cholesterol (mg/dL)	84.0±38.6	86.2±39.0	99.5±41.9	87.8±34.4
C-reactive protein (mg/dL)	0.5±1.0	0.6±0.6	0.4±0.5	1.7±4.2

Table 2 Changes of Dietary consumptions

	Not stir-fried olive oil (n = 14)		Stir-fried olive oil (n = 13)	
	Baseline	12 weeks	Baseline	12 weeks
Kcal (kcal)	1173.4±466.3	1992.3±295.8	1328.9±499.1	1929.6±405.1
Animal protein (g)	17.3±12.0	47.0±7.0	17.6±12.7	45.5±9.6
Vegetable protein (g)	19.3±7.3	29.5±4.4	23.8±9.6	28.5±6.0
Animal lipid (g)	12.0±9.3	27.7±4.1	10.5±5.4	26.8±5.6
Vegetable lipid (g)	8.7±5.1	41.7±6.2	11.9±6.4	40.4±8.5
Carbohydrate (g)	209.9±71.8	259.7±38.6	241.9±91.1	251.6±52.8
Fiber (g)	9.6±4.0	13.4±2.0	12.7±6.8	13.0±2.7
Retinol (µg)	84.6±69.9	143.3±21.3	84.0±47.2	138.8±29.1
Niacin (mg)	6.7±3.2	18.5±2.8	7.7±3.8	18.0±3.8
Vitamin E (mg)	7.0±4.2	14.1±2.1	8.9±4.7	13.6±2.9
Cholesterol (mg)	190.9±152.8	496.9±73.8	245.9±172.0	481.2±101.0
Saturated fatty acid (g)	5.5±4.9	8.9±1.3	4.7±4.2	8.7±1.8
Monounsaturated FA (g)	5.7±5.0	29.0±4.3	5.5±5.9	28.1±5.9
Polyunsaturated FA (g)	3.6±2.8	9.1±1.3	4.0±5.3	8.8±1.8

Table 3 Changes of erythrocyte membrane fatty acids contents

	Not stir-fried olive oil		Stir-fried olive oil	
	Baseline	12 weeks	Baseline	12 weeks
Saturated	41.4±0.9	42.1±0.9*	41.3±0.6	41.7±1.2
Myristic	0.31±0.09	0.27±0.09	0.24±0.06	0.25±0.08
Palmitic	23.0±1.4	22.7±1.1	22.5±1.0	22.8±1.4
Stearic	17.9±0.9	18.9±1.2*	18.3±0.9	18.6±0.6
Lignoceric	0.21±0.05	0.19±0.05	0.22±0.05	0.19±0.08
Monounsaturated	15.7±0.9	15.2±1.2	15.3±0.8	15.2±0.9
Palmitoleic	0.44±0.24	0.35±0.16	0.39±0.16	0.36±0.12
Trans-oleic	0.24±0.07	0.25±0.05	0.25±0.04	0.34±0.23*
Oleic	14.7±0.7	14.4±1.0	14.4±0.7	14.4±0.9
Polyunsaturated	42.3±1.3	42.1±1.4	42.8±1.1	42.4±1.5
Omega-6	28.7±2.2	28.8±2.3	29.9±2.1	30.0±2.4
Linoleic	9.5±1.4	8.9±1.3	9.7±1.3	9.1±1.5
Arachidonic acid (AA)	14.3±1.8	14.8±1.6	14.8±1.5	14.9±1.5
Omega-3	13.6±1.9	13.4±2.3	12.9±2.3	12.9±2.7
Alpha-linolenic	0.19±0.10	0.16±0.08	0.15±0.04	0.13±0.06
Eicosapentaenoic acid (EPA)	1.6±0.5	1.5±1.1*	1.4±0.6	1.2±0.8
Docosahexaenoic acid	8.4±1.2	8.4±1.3	8.3±1.6	8.2±1.6
Omega-3 index	10.0±1.5	9.9±2.0	9.7±2.1	9.4±2.2
AA/EPA	10.0±3.3	12.4±5.3*	13.6±8.6	16.2±7.9
Omega-6/Omega-3	2.2±0.5	2.2±0.5	2.4±0.7	2.4±0.7
Total trans-fatty acid	0.40±0.07	0.42±0.08	0.42±0.05	0.51±0.24
Trans-palmitoleic acid	0.16±0.02	0.14±0.03	0.14±0.03 ^a	0.14±0.03
Trans-oleic acid	0.24±0.07	0.25±0.05	0.25±0.04	0.34±0.23*
Trans-linoleic acid	0.16±0.0	0.17±0.04	0.17±0.03	0.17±0.04
6-neolaiolic	0.02±0.01	0.01±0.00	0.02±0.01	0.02±0.03
cistrans linoelaiolic	0.05±0.01	0.05±0.02	0.05±0.01	0.05±0.03
transcis linoelaiolic	0.10±0.02	0.11±0.03	0.10±0.02	0.10±0.02

Data are expressed as means ± SD

The nonparametric Wilcoxon exact rank sum test was used to compare baseline data with 12 weeks data.

*P value <0.05 (mean values are significantly different from baseline).

^aP value <0.05 (mean values are significantly different from not heated olive oil).

Conclusions

◆ Taking olive oil of 30 grams per week with cooked food did not positively effects on the FA contents of the erythrocyte membrane except for increased serum albumin level and stir-frying with olive oil may be harmful because of increasing trans-oleic acid in HD patients

