The Effect of Conjugated linoleic acid (CLA) Supplementation after 8 weeks of endurance training on Serum Lipid profile in atherosclerotic patients

Soleimani Mahdi1*, Ebrahimi Farahnaz2, HasanShahi Mahshid3, Nemati Ala eddin2, Hashemi Ghiri Elham3, Hadizadeh Ali4, Asodeh Mehran4, Mozafari Mehran4

1- Ph.D student in sport physiology, exercise physiology research center, Baghiatollah University of Medical Science, Tehran, Iran
2- Department of physical education, Arsanjan branch, Islamic Azad University, Arsanjan, Iran
3- Department of Physical education, Ghirokarzin Branch, Islamic Azad University, Ghirokarzin, Iran
4- (MSc) Department of Physical education, Qaemshahr Branch, Islamic Azad University, Qaemshahr, Iran

*Corresponding Author, Email: msoleimani792@gmail.com

Abstract

Purpose: Atherosclerosis is one of the main causes of mortality in developed countries. Conjugated linoleic acid (CLA) effects of anti-obesity, anti-cancer, anti-tumor, reduce the risk of atherosclerosis, lowering high blood pressure and diabetes, energy metabolism and has anti-inflammatory properties in human samples. The purpose of this study is the affect of Conjugated linoleic acid Supplementation after 8 weeks of endurance training on Serum Lipid profile in atherosclerotic patients.

Materials and Methods: This is a double-blind, placebo-controlled clinical trial, 16 patients 35 to 45 years old with atherosclerosis enrolled and ran randomly divided into two groups (experimental and control). Experimental group for 8 weeks and two sessions a week of exercise program and supplementation with CLA. Each experimental group participants must be 3 capsules CLA (per capsule = 1 g) before and after each training session and was taking morning exercises. Serum lipid parameters (total cholesterol, triglycerides, LDL and HDL) after 8 weeks of endurance training and supplementation with CLA were measured. The collected data were analyzed by kolmogorov-smirnov test, independent and paired t test with significance level (P<0.05).

Result: Findings showed that 8-week endurance training program with supplementation with conjugated linoleic acid lead to a significant reduction level serum lipid parameters in total cholesterol (P=0.037), triglycerides (P=0.041), LDL (P = 0.043) and a significant increase of HDL (P = 0.038), that changes in the experimental group compare with the control group was statistically significant. Conclusion: The results of this study showed that the exercise protocol and supplementation with conjugated linoleic acid can reduce levels of triglycerides, LDL, total cholesterol and HDL cholesterol good strategy in the prevention and reduction are risk factors for cardiovascular disease, such as the atherosclerosis.

Keywords: atherosclerotic patients, Lipid profile, Supplementation, Conjugated linoleic acid (CLA)

Introduction

Cardiovascular disease is one of the main causes of death in developed and developing countries, including Iran, so that half of the deaths are reported annually (Hatmi et al., 2007). Cardiovascular disease often starts with the background of atherosclerosis, A serious cause of disease, disability and death in many countries including
Iran. Epidemiological studies have shown that lipid disorders and cardiovascular diseases are major risk factors. Atherosclerosis is one of the most important causes of morbidity and mortality throughout the world that overweight and obesity's are independent risk factors for atherosclerotic cardiovascular diseases (Libby, 2005). New medical findings on the role of inflammation in the onset of atherosclerosis, from early stages to advance and thrombosis problems, emphasize, if not today, not only from the perspective of atherosclerotic disease of lipid accumulation, but as a chronic inflammatory process of the study is to (Roberts et al., 2006).

Atherosclerosis, a disease that for years inside the arterial wall may be covered with remaining fat. Continue forming the remaining fat deposits is called plaques in the artery walls, causing the arteries to become narrow and blood flow is reduced. This plaque can reduce blood flow through the artery to the extent that they cause angina and heart attack. In general, coronary artery disease is a progressive disease, with narrowing or blockage of the arteries, resulting in atherosclerosis (the formation of fatty plaques in the inner walls of blood vessels) occur (Kasper et al., 2004). Limit's blood flow to heart muscle and reduces the oxygen supply to the muscles are damaged from lack of oxygen. Although diffuse or systemic risk factors, a person is prone to the disease. Atherosclerosis preferentially affects the blood flow to certain areas and Based on the characteristics of the involved sight of lesions presents specific clinical symptoms that may vary (Kasper et al., 2004). Integration and transformation (oxidation and glycation) rich lipoproteins, including LDL cholesterol, that is followed by the accumulation of white blood cells (including monocytes and lymphocytes) and consists foam cell formation, including the formation of a plaque atherosclerotic are (Lusis, 2000). Causes and risk factors of atherosclerotic disease can be family history, diet, obesity, hyperlipidemia) cholesterol, triglycerides, blood lipoprotein levels and decreased HDL), hypertension (high blood pressure), diabetes, chronic kidney disease, smoking, inactivity, stress, hyper fibrinogenemia, could be (Kharb, 2000). Hyperlipidemia is a risk factor for atherosclerosis, including hypercholesterolemia and hypertriglyceridemia (Sinkovic et al., 2006). Cholesterol, triglycerides and lipoprotein today mostly associated with major causes of mortality in different countries are examined. Not only abnormal concentrations of lipids and lipoproteins are the main risk factors for cardiovascular disease, But the available evidence indicates that changes in lipid and lipoprotein levels in the food or drug interactions can also significantly alter the incidence of cardiovascular disease (Fauci et al., 2008).

Nowadays, the study of factors affecting the blood may be a way to prevent this disease in susceptible individuals. The most important of these factors are lipid compounds. The high concentration of cholesterol in the blood plasma proteins, mostly as low-density lipoprotein (LDL) is found, the main cause is atherosclerosis (Beattie et al., 2005). Research shows that the oxidation of this compound as OX-LDL represents the first step in the development of atherosclerosis and cardiovascular diseases (Bahoran, 2005). According to research conducted precipitate LDL and TC, TG in coronary arteries causing narrowing of the vessel wall can be followed by 1% cholesterol and reduce the risk of cardiovascular disease is 2 to 3% down. As well as increased low-density lipoprotein (LDL) is an independent risk factor for coronary heart disease and its reduction of 60 mg/dl decrease in the incidence of coronary heart disease within two years is 50% (Vuorhmaa et al., 2005; Law et al., 2003). Based on existing research, implementation exercise has a positive role in the prevention and treatment of atherosclerosis. Regular and long-term exercise training improves function, regulation of body weight, fat mass, improved lipid profiles in subjects with visceral fat content changes, thereby reducing the incidence of cardiovascular disease and increased longevity (Punyadeera et al., 2005). Research has shown that endurance exercise, including activities that can occur in patients with arterial occlusion disease as a factor therapy may be helpful (Pearson et al., 2003). Influence of exercise on oxidized LDL and thus reduce the risk of heart disease, helps in this regard (Wang et al., 2004). Studies have even shown that exercise, in addition to lowering LDL biochemically; also beneficial changes in LDL structure (Houmard et al., 1994). Recent studies show that regular exercise can be between 5 to 10 percent reduction in low-density lipoprotein and high-density lipoprotein, followed by 3 to 6% increase (Volaklis, 2007). According to the research, taking some anti-inflammatory and antioxidant nutrients may influence cardiovascular disease can affect the healing process. Today, the positive effects of conjugated linoleic acid (CLA) have attracted the attention of many researchers (Avrimation, 1996; Sneddon et al., 2008). Including the performance of anti-obesity, anti-cancer, anti-tumor and reduce the risk of atherosclerosis, lowering high blood pressure and diabetes, improving the adequacy of food, energy metabolism and anti-inflammatory properties in human specimens cited (Larsen et al., 2003). Conjugated linoleic acid (CLA), a polyunsaturated fatty acid that is naturally found in animal sources. 28 isomers of conjugated linoleic acid are the most predominant form of dietary cis-9, trans-11 is known as Rumenic acid. The isomer of conjugated linoleic acid, 90% in food intake (Belury et al., 2002). Values for the observed beneficial effects of conjugated linoleic acid between 1/0 to 1% of the total weight of the diet. However, dietary conjugated linoleic acid in men and women is about 500 mg per day have been reported. Thus, the beneficial properties of conjugated linoleic acid by diet alone will not ensure that there is a need to
supplement (Rizenthaler et al., 2001). According to high prevalence of cardiovascular disease and the positive effects of CLA in the recovery and prevention of cardiovascular disease and taking into account the physical activity can have a favorable role in these diseases has improved. This study examines the impact effect of conjugated linoleic acid Supplementation after 8 weeks of endurance training on Serum Lipid profile in atherosclerotic patients.

Materials and Methods

Research design and sampling: This study was designed as a randomized, double-blind, randomized clinical trial with pretest and posttest. The study population of men 35 to 45 years old with atherosclerosis Tehran Imam Ali (AS) hospital organizations. In this on 16 patients with atherosclerosis with an age range of 35 to 45 years with angiography and diagnosed by specialists according to New York Heart Association coronary heart disease in the United States proved, Participated in the study and randomly divided into two groups of 8 persons. Volunteers with acute heart failure, acute arrhythmia, or chronic inflammatory disease were excluded from the study.

Methods of data collection: Data collection methods to collect primary data, such as those examined medical records (history of the disease, surgery, and family history), a consent form, measuring height, weight, blood pressure, heart rate, cardiovascular risk factors, and outcome evaluation with emphasis on physical fitness, and cardiopulmonary fitness was measured. After completing medical records and clinical examinations, patients who participated in the briefing and clinical limitations and the general willingness of people to participate in physical activity was explained. The patients were randomly divided into control and experimental groups. The experimental group had a group of 8-week program of aerobic exercise and supplement conjugated linoleic acid (CLA) has also received in this period. Control group that had no intervention by the investigator to exercise and supplements if they were not. Experimental group for 8 weeks and two sessions a week of exercise program and supplementation with CLA. Each experimental group participant must be 3 capsules CLA (per capsule = 1 g) before and after each training session and was taking morning exercises. Control group during the same period, daily3 received placebo capsules containing olive oil Zahravi companies. At the start of the study, depending on the CLA and placebo capsules (48 tablets supplement or placebo) per person per experimental and control groups were given, and they were asked; physical activity, diet and lifestyle during their implementation plans do not change. Also, during the study of changes in the type and dose of drugs was performed. Both control and experimental groups before starting the program (pretest) and after 8 weeks of training (post-test), blood samples were taken.

Training protocol: The study protocol consisted of two sessions per week for 8 weeks of exercise. Program sessions include a 10 minute warm up with a variety of stretching, exercising and running. The process of continuous running with a constant intensity of 60 to 70 percent HRR formula (Karvonen) was done using a stethoscope belt. In the first session that was run for 20 minutes per session 3 minutes running time will be added. Maximum heart rate formula 220 - age was calculated. At the end of each session, the cooling performance of running, stretching and exercise was done for 10 min. In addition, patients with any sign of danger, such as shortness of breath and chest pain, or severe nausea or fatigue while exercising should be discontinued. During training sessions, heart rate and blood pressure in subjects with a traumatic wrist device to measure blood pressure (optima Model SE6400 Korea) was monitored. Control group, Taking supplementation and exercise were prohibited.

Laboratory measurement methods: Weight subjects minimally clothed without shoes using a digital scale hi-tec models made in Germany with a sensitivity of 100 g was measured. Height with height gauge (BSR model) manufactured in Iran in a standing position without shoes, although the shoulders were in a normal condition, the sensitivity was measured with a centimeter. Body mass indexes (BMI) by dividing weight in kilograms by the square of height (m) were calculated. In this study, CLA supplementation of one gram capsules containing 80% CLA isomers in the ratio 50:50 (cis-9, trans-11 and cis-12, trans-10) were obtained from the Puritan Company of America. Variables of the study, blood samples after a 12 hour fast and a 2 stage (before and after 8 weeks of exercise training), the right hand vein of each subject after 5 minutes of sitting on a chair, 5 ml blood was taken. Concentrations of triglycerides, total cholesterol, HDL and LDL spectrophotometrically using kits Pars test measuring machine (BS-380 mindray) were included.

Statistical Analysis: Data are presented as means ± standard deviation (SD). The Kolmogorov-Smirnov test was used to check the normal distribution of the data. Independent t-test was used for within-group and dependent t-tests was used to compare the between groups. P<0.05 were considered statistically significant.
Results

Descriptive characteristics and anthropometric groups (experimental and control) in terms of age, weight, height and BMI are presented in Table 1. The results of tests carried out showed that the 8-week endurance training program with supplementation with conjugated linoleic acid (CLA) led to a significant reduction in serum total cholesterol, blood lipid parameters (P = 0.037), triglycerides (P = 0.041), LDL (P = 0.043) and a significant increase of HDL (P = 0.038) were statistically significant changes in the experimental group compared with the control group was statistically significant. Changes in lipid parameters in each experimental group after 8 weeks of aerobic exercise and supplementation with conjugated linoleic acid compare to 8 weeks before doing the protocol is given in Table 3, shows the implementation of training and supplementation protocols have significant positive effects in reducing cholesterol levels (p=0.021), Triglyceride (p=0.032) and LDL (p=0.028) and increase amounts HDL (p=0.018).

Table 1: shows the characteristics of the study subjects

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Height (cm)</th>
<th>Weight (kg)</th>
<th>Age (years)</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>170±5</td>
<td>80±6</td>
<td>40±4</td>
<td>27±3</td>
</tr>
<tr>
<td>Control</td>
<td>172±4</td>
<td>78±5</td>
<td>39±5</td>
<td>26±4</td>
</tr>
</tbody>
</table>

Table 2: Comparison of serum lipid parameters before and after 8 weeks of aerobic exercise and supplementation between experimental and control groups (n = 8)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Before starting the protocol (Mean ± SD)</th>
<th>After 8 weeks (Mean ± SD)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Experimental</td>
<td>Control</td>
<td>P</td>
</tr>
<tr>
<td>total cholesterol mg/dl</td>
<td>213±5</td>
<td>208±4</td>
<td>0.701</td>
</tr>
<tr>
<td>Triglycerides mg/dl</td>
<td>189±8</td>
<td>178±6</td>
<td>0.853</td>
</tr>
<tr>
<td>LDL mg/dl</td>
<td>166±10</td>
<td>161±9</td>
<td>0.795</td>
</tr>
<tr>
<td>HDL mg/dl</td>
<td>41±4</td>
<td>±3</td>
<td>0.805</td>
</tr>
</tbody>
</table>

P values < 0.05 Dependent t-tests

Table 3: Mean ± SD of serum lipid parameters before and after 8 weeks of endurance Exercise and supplementation in the experimental group (n = 8)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Before (Mean ± SD)</th>
<th>After 8 weeks (Mean ± SD)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Experimental</td>
<td>Control</td>
<td></td>
</tr>
<tr>
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<tr>
<td>Triglycerides mg/dl</td>
<td>189±8</td>
<td>175±6</td>
<td>0.853</td>
</tr>
<tr>
<td>LDL mg/dl</td>
<td>166±10</td>
<td>141±7</td>
<td>0.795</td>
</tr>
<tr>
<td>HDL mg/dl</td>
<td>41±4</td>
<td>52 ±6</td>
<td>0.805</td>
</tr>
</tbody>
</table>

P values < 0.05 independent t-test

Discussion and Conclusion

The results of this study have shown that Conjugated linoleic acid supplementation of 3 g per day session with aerobic activity showed a significant decrease in serum levels of blood lipids, total cholesterol, triglyceride,
LDL and significant increase in HDL levels. These Changes in the experimental group compare with the control group was statistically significant.

Review of research regarding the impact of simultaneous exercise and supplementation with conjugated linoleic acid (CLA) on serum lipid markers of atherosclerosis has not been investigated. However, studies have shown that some supplements and nutrients can be reduced accumulation of triglycerides and increasing HDL levels. Some of these foods can supplement conjugate linoleic acid (CLA) noted (Verady et al., 2005). Several studies have shown that consumption of conjugate linoleic acid improves the serum lipid profile and can reduce the risk of atherosclerosis (Trine et al., 2006). Colakoglu et al (2006) in a study on healthy people, as they conjugated linoleic acid supplementation on lipid profile following aerobic exercise can significantly reduce levels of triglycerides, LDL and an increase in HDL. Research conducted on animal models have shown that conjugated linoleic acid supplementation can significantly reduce plasma cholesterol, prevent atherosclerosis, reduce LDL and cholesterol accumulation in vascular beds is reduced (Nicolosi et al 1997; Lee et al., 1994). Lipoproteins, especially LDL and HDL in cardiovascular disease often have a decisive role. Reduce levels of LDL and is associated with increased cardiovascular disease and vice versa with increasing amounts of risk for cardiovascular disease than is LDL (Kathiresan et al., 2008).

Arteriosclerosis (atherosclerosis) is a disease characterized by lipid deposition and other material on the inner wall of the vessel to be determined. The result of this process is the formation of fibrous plaques - fat (atheroma) that increased with age and cause of stenosis, and the other is a consequence of (Berliner et al., 1995). Atherosclerosis, a major cause of death in adults developed countries, so the United States alone has cost $112 billion annually. Atherosclerosis, the main cause of disease in the arteries of the heart and brain ischemia is considered. This condition is a chronic inflammatory process in which risk factors for metabolic reactions and trigger safety processes; expansion and activation of these lesions are large and medium arteries. Atherosclerotic lesions or lobar looking forward notching eating followed by detachment of endothelial cells in the vessel caught lesions arise; it can lead to heart failure and brain (Berliner et al.,1995; Gordon et al.,1997). It Seems to, hypercholesterolemia causes focal activation of endothelial cells in large and medium arteries and retention lipoproteins especially with low density (LDL) in the intima layer, is a major factor in the process of atheroma formation. The oxidation of lipoproteins by free radicals that are produced by macrophages and enzyme changes in the intima, that induces lipid production in terms of survival are activated. Endothelial and smooth muscle cells in atheroma environment may have an important role in this process. These lipoproteins are oxidized releases phospholipids the endothelial cells of blood vessels, especially in places that have hemodynamic pressure, make active. Oxidized LDL stimulation of inflammatory reactions and attract blood monocytes, mobilization and proliferation of macrophages derived from monocytes are recruited. These inflammatory reactions of oxidized LDL appear to destroy. In this pathway, oxidized lipids, macrophages are more active and enhance their oxidation phenomena. In the presence of hypercholesterolemia, inflammatory responses that neutralize the effects of oxidized LDL are started; they cannot complete their performance and in turn the cycle of inflammation, oxidation of lipoproteins and inflammation of the intima remains intact. T lymphocytes in the early stages of atherosclerotic lesion participating in the inflammatory responses that perpetuate a vicious cycle. Macrophages and smooth muscle cells engulf oxidized lipoproteins and their cytoplasm is filled Cholesterol esters containing droplets and bubbles and Foam cells. Artery blood flow in places that are prone to atherosclerosis (arterial bifurcation), so that it puts pressure on endothelial cells. This process results in increases the molecules (Adhesion molecules) on the surface of endothelial cells and other cells that power the Adhesion of cells to the environment and other cell's increases. Furthermore, inflammatory molecules in the hyperbaric environment by more are produced by endothelial cells. As a result of hemodynamic stress and increased blood lipoprotein induces activation of the inflammatory process in the arterial wall are (Hokanson et al 1996; Alexander et al 2000, Simes et al., 2002; Pekkanen et al 1990). In general, lipids play an important role in atherosclerosis and cholesterol; mainly low-density lipoprotein (LDL) is associated with an accelerated atherosclerosis process. High-density lipoprotein (HDL), by contrast, has a protective role between blood levels and CAD risks are inversely related. To increase triglyceride levels are often associated with lower LDL levels and an independent risk factor for CAD is considered (Darabian et al., 2007). On the other hand, HDL cholesterol by stimulating the release of prostacyclin (PGL-2) from the wall or vascular smooth muscle cells, inhibition of platelet aggregation and Leading to a loss of adhesion molecules (Lerch et al., 1998). Sedentary lifestyle as a risk factor for cardiovascular disease, so the risks of atherosclerosis in people who exercise a part of your daily activities are much less had been reported (Ribeiro, 2009). Finally, according to several studies, particularly in relation to the physical activity of the positive effects of aerobic exercise on lipid profile, this means that physical activity is inversely related to the level of total lipid and directly correlates with significantly increased high-density lipoprotein, appropriate intensity activities may be useful for cardiovascular disease. Therefore, modification of physical activities such as endurance activities on endothelial abnormalities
and vascular inflammation associated with atherosclerosis and the development of obesity and sedentary epidemic in this century and more attention to taking dietary supplements such as conjugated linoleic acid. Because of the positive impact of removing atherosclerotic plaques may have a preventive strategy against diseases such as cardiovascular disease is associated with inflammation and lipid profile.

References


