Acute Effect of Extreme Sports on Serum Lipids

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Abstract

Purpose: The aim of this study is to determine the effect of rafting and paragliding exercises by sedentary males on serum lipids.

Material and Methods: 17 male rafters and 10 male paragliders volunteers (non-smoker, no known history of cardiovascular disease, body mass index <25 kg/m², and no intake of prescription medications) participated in the study. Participants had blood samples taken a day before and after rafting and paragliding practices. Data were analyzed by Wilcoxon and Mann–Whitney U tests.

Results: Significant decreases occurred for the low-density lipoprotein (LDL)/very low-density lipoprotein (VLDL) ratio in the rafting group after the exercise; though, there was no significant difference in serum lipids parameters of the paragliding group after the exercise.

Conclusion: While acute rafting and paragliding exercises have similar effects on TG and HDL, effect on LDL / VLDL ratio is different.

Key words: Exercise, Lipid, Paragliding, Rafting

INTRODUCTION

Rafting and paragliding are extreme sports that people participate in both for competition and entertainment purposes. According to Willig, rafting and paragliding can be among some of the most extreme sports activities.[1] While Williams and Soutar and Buckley referred that rafting is a challenging activity of adventure tourism, on the other hand,[2,3] Hinch and Higham and Roberts defined it as an extreme activity for sporting adventure.[4,5] Rafting is a group activity, in which four to eight people participate and single-winged paddles and inflatable boats are used.[6] As the level of challenge increases in rafting activities, more mental and physical concentration is required.[7]

Paragliding is the flight of pilots with a special made seat. The basic equipment can be listed as a parachute, a seat, and a spare parachute.[8] According to Mekinc and Mušič, paragliding is a kind of sport that is both exciting and competitive.[9]

Lipids have different derivatives according to their structures and functions. Triglycerides are esters formed by the molecular fatty acid with glycerol.[10] These are neutral fats synthesized from carbohydrates and stored in the fat tissue. Lipids in foods state in the form of TG. In the small intestine epidermis and fat cells, fatty acids bind glycerol and combine to form TGs. Cholesterol is sterol, which is either a free or an esterified form. Free cholesterol is a component of the cell membrane; esterified cholesterol is usually locates in the serum and states in atheromatous plaques.[11,12]

Cholesterol is an organic substance placed in human and animal tissues and cells, also used in the synthesis of Vitamin D synthesis, calcium and phosphorus, building blocks of cell membranes, bile acids, and sex hormones.[13] High-density lipoprotein (HDL), which is synthesized by both the liver and small intestine and is responsible for cholesterol transport from tissues to the liver, contains 50% protein, 20% cholesterol, 5% TG, and 25% phospholipid.[14] Low-density lipoprotein (LDL) contains 20% protein, 50% cholesterol, 5% TG, and 25% phospholipid.[14]
task of LDL is to carry cholesterol from the liver to the peripheral tissues and regulates cholesterol synthesis again in this region.\cite{10} The lipoprotein with very LDL (VLDL) contains 5% protein, 30% cholesterol, 55% TG, and 10% phospholipid. They are synthesized from the liver and contain TGs that are synthesized from circulating fatty acids or carbohydrates. VLDL also contains significant amounts of cholesterol and cholesterol esters. Once the VLDL is combined in the liver, it becomes LDL in fat tissue and muscles.\cite{10,15}

Intensity and duration of exercises effective on reducing body weight since it will be crucial to promote lipid activity and usage of active muscles. Thus, it is important to address the effects on lipid oxidation and lipolysis in relation to its intensity and duration of acute exercise.\cite{16} It showed an increase in lipolysis and it oxidation by the active muscles during an acute aerobic exercise.\cite{17} In addition, fatty acids are essential energy substrates during endurance exercise. Acute endurance exercise is associated with skeletal muscle lipid remodeling and neutral lipid storage during recovery.\cite{18} This study aimed to determine the acute effects of rafting and paragliding on serum lipids and to compare the effects of these two sport activities.

**MATERIALS AND METHODS**

**Subject**

A total of 17 rafting and 10 paragliding participants (n = 27) were physically active men volunteered to participate in the study. They were not experienced in rafting and parachuting practice before the study. The rafting group demographics were: Age = 22.24 ± 3.07; height = 179.65 ± 6.61; weight = 73.59 ± 7.77; and body mass index (BMI) = 22.8 ± 1.99 and paragliding groups, age = 28.2 ± 10.28; height = 176.0 ± 8.19; weight = 76.8 ± 16.12; and BMI = 24.66 ± 3.93. The inclusion criteria were: Non-smoker, no known history of cardiovascular disease, BMI <30 kg/m², and no intake of prescription medication or antioxidant supplements. All participants completed written informed consent.

**Exercise Protocols**

The participants were given basic rafting and paragliding technical and safety trainings before the study (2 weeks - 5 days per week). The paragliding took place and occurred by flying from a slope at an altitude of 1500 m. The rafting took place in the river with a rapid difficulty rating of 2+1 at an altitude of 1150 meters. Both rafting and paragliding exercises were standardized at a duration of 20 min.

**Blood Samples Analyze**

Participant blood samples were taken for each rafting and paragliding practices’ a day before at 09:00 AM (pre) and immediately 15 min after practices’ at (post) at 09:00 AM. All blood samples were drawn in ethylenediaminetetraacetic acid-treated tubes and placed on ice until processing. Whole blood aliquot samples were analyzed for hematocrit and hemoglobin. Remaining sample aliquots were centrifuged at 4°C for 15 min at 3000 rpm (Centra-8R IEC, MA). Subsequently, the samples were analyzed by COBAS 600 (Roche) brand autoanalyzer for lipid profiles.

**Statistical Analysis**

Statistically, analysis was performed with SPSS 22.0. The data set was found to not be normally distributed; therefore, we used the Wilcoxon test to compare intragroup values and Mann–Whitney U test to compare intergroup values.

**RESULTS**

There was a significant increase in the LDL/VLDL ratio, but no significant difference in TG and HDL after rafting exercises and there was no difference in TG, HDL, or the LDL/VLDL ratio after paragliding exercises [Table 1].

**DISCUSSION**

Exercise is a factor that brings about different physiological effects in acute and chronic periods, especially according to severity of activity. Lipid is an energy source, at the same time, as it has many structural functions in the body. Specifically, during the long period exercises, there may be differences in the relative lipid concentrations in the blood due to the production of energy from the TGs. Our study was conducted to determine the acute effect of rafting and paragliding exercises, which are among the extreme sports, on blood lipid profiles.

We found out that there were no statistically significant changes in TG values, even though decreases were observed after both the rafting and paragliding exercises (P > 0.05; Table 1). These findings agree with the literature as similar studies report that some exercise practices do not result in any changes in the TG levels.\cite{23,28} Contrastingly, there are some studies detecting that the acute exercises decreased the TG levels. Magkos et al. reported that TG levels decreased significantly after the acute endurance exercises.\cite{24} Turgut et al. reported that TG values decreased significantly after acute swimming exercise among females.\cite{25}

There were no significant changes in HDL after either rafting or paragliding [Table 1]. Some researchers reported no significant difference in HDL values after acute endurance and resistance exercises.\cite{23} Mc CLEAN et al. reported in their study, in which they formed the control and exercise groups including healthy males loaded with...
high fatty food, that there were no meaningful differences between the groups in their HDL levels after the moderate acute exercises after 2 h from feeding time, according to the repeated measurement times as 2 and 4 h; however, in the measurements carried after the 3rd h, the HDL values of those who did exercises were meaningfully higher. Turgut et al. reported that HDL values increased significantly after acute swimming exercise among females. Valimaki et al. in athletes, who do intermittent and continuous running exercise, found that oxidation of HDL concentrations increased acutely in both types of exercise, claimed that these results enhanced the transport of lipid oxidation products by HDL in acute exercises, but the sporting history or the genetic makeup of the athletes could change these acute responses.  

Meaningful decreases in the LDL/VLDL ratio occurred after rafting only [Table 1]. This finding may occurred because rafting exercise may have required more muscular use than paragliding. To bring out the acute effects of exercise on the lipid profile, it can be thought that either the duration or the intensity of the exercise needs to be increased.

Regular exercise affects lipid metabolism, changes plasma lipid and lipoprotein levels - in a positive fashion and reduces the risk of atherosclerosis. However, these effects on the lipoproteins from exercise depend on the sex, body weight, body fat distribution, sports activity, duration, and intensity of exercise, and whether the exercise has effect on weight loss or not. It reported that there was no difference in VLDL-TG concentrations after acute endurance exercises in some research. Findings of McClean et al. revealed no significant difference in LDL levels between the groups after moderate acute exercise 2 h after feeding. Medlow et al. referred that the acute exercise might increase the sensitivity of LDL. Lira et al. claimed that the acute resistance exercise might cause changes in lipid profile at specific density and lipid profile might indicate that low- and medium-intensity exercises may have been more useful than high-intensity exercises rafting and paragliding are high intensity exercises as they are extreme sports. Due to the high-intensity nature of these sports, the results of Lira et al. supported our present research findings.

**CONCLUSION**

- The paragliding does not have any significant effect on the blood lipid profiles,
- Rafting exercises are only effective at LDL/VLDL ratio.

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