Effect of aerobic exercise intervention on liver metabolism in college students

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Abstract

This To investigate the effect of aerobic exercise on liver function in college students. Ten male college students from the first year of college volunteered for the study. They were divided into normal body recombination(n = 5) and obese groups(n = 5) based on weight. All subjects performed aerobic exercise interventions for 10 weeks that 6 days per week. The results: (1) the level of normal recombinant triglycerides was significantly lower than that of obese groups($p < 0.05$), HDL/LDL is significantly higher than the obese group($p < 0.05$), lipoprotein a1 was higher than obese group($p < 0.05$), but not statistically significant. (2) HDL/LDL was significantly negative correlation with weight($p < 0.05$), waist circumference($p < 0.05$), BMI ($p < 0.05$), lipoprotein a1 was significantly negatively related to triglycerides($p < 0.05$). (3) 10 weeks of aerobic exercise interventions significantly increased HDL, LDL, and total cholesterol levels($p < 0.05$) . However, the effect on weight, waist circumference and BMI was not statistically significant(all $p < 0.05$). Conclusions: Short-term exercise interventions did not effectively promote the improvement of liver function in the subjects, and diet may play a more important role in this process.

Keywords

Aerobic exercise; University students; Liver function; Triglycerides.

1. Introduction

In recent years, studies on the effects of aerobic exercise intervention on nonalcoholic fatty liver disease [1, 2] have shown that moderate-intensity aerobic exercise intervention significantly reduces the level of aspartate aminotransferase/alanine aminotransferase (AST/ALT), whereas aerobic exercise The need for better cardio-respiratory fitness is a challenge for obese people. Resistance training can be used by obese non-alcoholic fatty liver disease (NAFLD) patients because of its low requirements for cardiorespiratory fitness. Domestic scholars Yang Shengnan [3] and Japanese scholars [4] found that as long as simple resistance training, the liver function of patients with NAFLD can be significantly improved. The common problem of the above studies is that there is no indication of whether or not to change the diet. Scholars have gradually noticed that the effect of exercise combined diet intervention is more significant than that of relying solely on exercise [5, 6, 7, 8], Teruki et al. [9] found that Changing your lifestyle can reduce the risk of NAFLD. Therefore, this study explores the effects of aerobic exercise on obesity and normal body weight on liver function, in order to provide a theoretical basis for the treatment of NAFLD.

2. Materials and Methods

2.1 Study participants

The subjects were male students from the first year of college. All the subjects did not have bad habits such as smoking and alcohol abuse. They volunteered to join this experiment. They are very familiar with potential risks, experimental procedures and test indicators. They can adhere to the requirements in the experimental design and fulfill relevant requirements. The obligation to adhere to the completion of the experimental process.

2.2 Ethical approval

All procedures in this study involning huaman participants were in accordance with the Declaration of Helsinki and were approved by the ethics committee of Sichuan University of Arts and Science.

2.3 Exercise intervention

Participants completed 6 weeks of exercise intervention, 6 times per week and rest on Sunday. The exercise is composed of 20 push-ups and moderate intensity running 400 meters. The most suitable exercise heart rate (heart rate) = maximum heart rate of 75-80%, 8-10 minutes of warm-up exercise each time, the duration of each exercise duration is 60 minutes.

2.4 Laboratory methods

Laboratory test methods: height, waist circumference and body weight are used to evaluate body morphology, aspartate aminotransferase (AST), alanine aminotransferase (ALT), triglyceride (TG), total cholesterol (TC), high density cholesterol (HDL) Low-density cholesterol (LDL) was used to evaluate lipid metabolism, and apolipoprotein a1 was used to evaluate the ability to transport lipids. All tests were performed in the Department of Clinical Laboratory of Dazhou Second People's Hospital.

2.5 Data analysis

All data were represented by mean value and standard deviation. SPSS20.0 software was used for statistics. Independent sample T test was used in different groups before and after intervention, and paired T test was used for the same group before and after intervention. Any $P<0.05$ showed significant difference. Pearson correlation coefficient was used to represent the relationship between changed BMI and sperm motility (%) in all subjects.

3. Results.

3.1 Characterization of the subjects:

Compared with the control group, the waist group, body weight and BMI of the obese group were significantly higher than those of the control group. The alanine aminotransferase, and H/L were significantly lower than the control group, and the triglyceride level was significantly higher than that of the control group. In the group, the apolipoprotein a1 control group was higher than the obese group, but it was not statistically significant. Although other variables are different, they have not reached statistical significance. See Table 1 for details. The ratio of high-density lipoprotein (good lipoprotein) to triglyceride normal body recombination was significantly higher than that of the obese group.

Table 1 Comparison of obese populations with normal body weight and blood lipid levels(mean ± S D).

	Nomarl weight （n=5）	Obensity (n=5)	P
Age(Y)	18.8±1.0	19.0±0.0	0.638
Height(cm)	167.0±2.4	174.3±6.0	0.074
Weight(kg)	65.5±12.1	95.7±9.8	0.017
Waist circumference (cm)	77.3±10.6	105.7±4.5	0.008
BMI(kg/m2)	23.5±4.0	31.4±1.8	0.026
ALT(U/L)	16.3±3.5	35.3±9.7	0.014
AST(U/L)	21.8±5.0	24.0±9.2	0.690
ALP(U/L)	114.3±6.0	63.7±10.7	0.000

TC(mmol/L)	0.97±0.13	1.38±0.28	0.046
HDL(mmol/L)	1.35±0.44	0.89±0.12	0.142
LDL(mmol/L)	1.76±0.53	1.79±0.40	0.940
H/L	0.78±0.18	0.50±0.05	0.048
H/TG	1.53±0.38	0.68±0.24	0.029
Apolipoprotein a1(g/L)	0.98±0.07	0.90±0.05	0.164

3.2 Analysis of body type and blood lipid parameters

Body weight was significantly negatively correlated with H/L, positively correlated with alanine aminotransferase, and negatively correlated with alkaline phosphatase. Waist circumference was positively correlated with alanine aminotransferase; BMI was positively correlated with alanine aminotransferase and negatively correlated with H/L. Other indicators showed no significant correlation or related trend, as shown in Table 2.

Table 2. The relationship between body type and blood lipid parameters.

	Weight(kg)	WC(cm)	BMI(kg/m2)
ALT(U/L)	0.78(0.04)	0.79(0.04)	0.86(0.01)
AST(U/L)	0.28(0.54)	0.25(0.59)	0.40(0.37)
ALP(U/L)	-0.71(0.07)	-0.79(0.03)	-0.70(0.08)
TC(mmol/L)	0.41(0.30)	0.53(0.23)	0.47(0.23)
HDL(mmol/L)	-0.29(0.53)	-0.35(0.44)	-0.19(0.68)
LDL(mmol/L)	0.46(0.30)	0.32(0.49)	0.48(0.28)
H/L	-0.79(0.03)	-0.75(0.05)	-0.75(0.05)
Apolipoprotein a1(g/L)	-0.51(0.24)	-0.55(0.20)	-0.57(0.19)

3.3 Changes in body weight, waist circumference and BMI before and after intervention

Exercise-linked intervention did not significantly reduce body weight, waist circumference, and BMI, as shown in Table 3.

Table 3 The effect of exercise on weight, waist circumference and BMI.

	pre	post	P
Weight(kg)	78.4±7.2	77.7±7.7	0.90
WC(cm)	89.4±6.5	87.3±6.1	0.81
BMI(kg/m2)	26.9±2.0	26.1±2.0	0.80

3.4 Changes in liver function indicators before and after intervention

Exercise intervention significantly increased the levels of HDL and LDL. Although HDL/LDL was improved, it did not reach statistical significance. The intervention significantly increased the level of total cholesterol and increased the level of apolipoprotein a_1, but did not reach a statistically significant level. The effects of intervention on ALT, AST, total bilirubin and triglyceride did not reach significant levels, as shown in Table 4.

Table 4 Comparison of liver function hematological parameters before and after intervention (n=10)

	Pre	Post	T	P
ALT(U/L)	24.4±4.5	25.6±6.3	0.148	0.89
AST(U/L)	22.7±2.4	24.0±3.2	0.321	0.59
TG(mmol/L)	3.4±0.2	4.0±0.3	1.786	0.04
TC(mmol/L)	1.1±0.1	1.2±0.1	0.277	0.60
HDL(mmol/L)	1.0±0.1	1.2±0.1	1.339	0.05
LDL(mmol/L)	1.8±0.2	2.0±0.2	0.894	0.04
HDL/LDL	0.60±0.08	0.62±0.09	0.177	0.54
a1(g/L)	0.94±0.03	0.99±0.07	0.639	0.44

4. Discussion

The main findings of this study were follow: (1) Apolipoprotein a_1 was significantly negatively correlated with triglyceride, ALT was significantly positively correlated with waist circumference, body weight and BMI, and H/L was significantly negatively correlated with waist circumference, body weight and BMI. HDL and LDL levels and body type were not significantly correlated, suggesting that H/L and H/TG can be used as clinically more sensitive indicators. (2) Intervention not only significantly increased HDL levels, but also significantly increased LDL levels, but did not significantly affect H/L levels. Exercise intervention did not significantly reduce weight, waist circumference, and BMI.

Lower HDL levels are significantly associated with increased risk of coronary heart disease [10]. The specific mechanism is that HDL can reverse the cholesterol in the arterial wall to the liver for catabolism, which helps prevent atherosclerosis. When the waist circumference or BMI increases, the prevalence and risk of low HDL increase significantly [11], and waist circumference and BMI are independent of HDL negative correlation, suggesting that maintaining a healthy waist circumference and body weight is very important in the prevention of metabolic diseases. important.

The ratio of serum total cholesterol to HDL can be used to evaluate coronary heart disease [12], which is more sensitive than cholesterol alone or HDL, and has important value in evaluating the prognosis of the disease [13,14]. More and more studies are beginning to use HDL:LDL or (LDL:HDL[15,16]) to assess the risk of coronary heart disease [17,18], and changes in liver function, the ratio can also be used to evaluate In the case of liver lipid metabolism, the study found that even in the case of such a small sample size, H:L was significantly negatively correlated with body weight, waist circumference and BMI, and the correlation coefficient was greater than or equal to 0.75.

Serum apolipoprotein A1 can be used as an important indicator of clinical response to liver function changes and lesions [19]. The normal range for males is 0.92 to 2.36 g/L. The average value of the subjects is 0.9, which is lower than the normal value. It is noted that once the threshold is exceeded, it has been explained that the body has reached a pathological state, which is a common problem that is currently neglected by medical institutions, and the average weight of the subjects is 0.98, which is within the normal range.

Effects of exercise on liver function and apolipoprotein

The intervention significantly increased HDL levels and also increased LDL levels. The effect on HDL/LDL levels was not statistically significant, increasing the level of apolipoprotein a1, but not statistically significant. The level of serum apolipoprotein a_1 plays an important role in the early diagnosis, guiding treatment and prognosis of liver cirrhosis, and its level of change can be used as a reliable indicator of liver function [20]. Zhao Ruixiang [21] and other cross-sectional studies on fitness running and control group (people who do not usually exercise) found that there was no significant difference between cholesterol and triglyceride levels in the two groups. The apolipoprotein a_1 level in the regular exercise group was significant. Higher than the control group. The mechanism of aerobic exercise to improve blood lipids is that the high-fat diet induces a decrease in the expression of apolipoprotein a1-mRNA, while aerobic exercise improves the expression of this high-fat-induced a_1-mRNA, thereby promoting blood lipid levels toward normal [22] .

5. Conclusion

Patients with NAFLD have higher triglyceride levels, lower HDL and HDL/LDL levels, understand changes in body shape, liver function, and apolipoprotein a1 levels, and help to better understand the occurrence of NAFLD. And development mechanism, provide a basis for clinical judgment and intervention, and HDL / LDL level can be used as a sensitive indicator to determine liver fat metabolism. Short-term exercise interventions did not effectively improve the liver function of the subjects, and the diet may play a more important role in this process.

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