EFFECTS OF SIX-WEEK ENDURANCE TRAINING METHOD ON SOME HAEMATOLOGICAL VALUES OF BASKETBALL PLAYERS

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ABSTRACT

The objective of the study is to determine the effects of a six-week endurance training method applied to amateur basketball players on some hematological parameters.

Athletes in the study group are volunteers engaged in basketball as an amateur in Erzurum. While creating the group of 16 male basketball players in the range of 18 – 20 years of age, it has been noted for them to not have any disease, not using any drugs regularly and not being in the process of an acute illness. Athletes applied endurance training program was built in the range of 25-60 minutes flat race throughout 6 weeks, 5 days a week with the interval training method. Interval training was built 1 set for first 2 weeks and 2 sets from third to sixth weeks to adapt the study group to training. Blood samples were taken from the subjects at the beginning of the study and analyzes were carried out. At the end of the study, 6 weeks later, blood samples were taken again and analyzes were performed and compared.

In this study, the effects of endurance training program applied to basketball players for six weeks on blood hematology values were investigated. After the analysis, it was observed that six weeks of endurance training have organized the liver enzymes of athletes and accelerated the burning of the fat depot. Moreover training has increased lipid oxidation. According to the obtained results, coaches must follow antioxidant-supported nutrition programs for athletes. Also taken into consideration of the individual and environmental factors in training programs is expected to improve performance of athletes.

Keywords: Basketball, Endurance, Blood Lipoprotein, Blood Mineral Levels

ALTI HAFTALIK DAYANIKLILIK ANTRENMAN METODUNUN BASKETBOLCULARDAKİ BAZI HEMATOLOJİK DEĞERLER ÜZERİNE ETKİSİ

ÖZET

Çalışmanın amacı; Amatör basketbolculara uygulanan altı haftalık dayanıklılık antrenman metodunun bazı hematolojik değerler üzerine etkisini tespit etmektir.

Çalışma grubundaki sporcular Erzurum ilinde amatör olarak basketbol sporuyla uğraşan gönüllü sporculardır. 18-20 yaş aralığındaki 16 erkek basketbolcu grubu oluşturulurken, herhangi bir hastalık taşımamalarına, düzenli ilaç kullanıyor olmamalarına ve akut bir hastalık sürecinde olmamalarına dikkat edilmiştir. Dayanıklılık antrenman programı uygulanan sporculara 6 hafta boyunca, haftada 5 gün interval antrenman metodu ile düz koşular 25-60 dakika aralığında yaptırılmıştır. Araştırman grubunun antrenmanlara adapte olmaları amacı ile interval antrenman ilk 2 hafta 1 set, 3. haftadan 6. Haftaya kadar ise 2 set halinde yaptırılmıştır. Deneklerden program başlangıcında kan örnekleri alınarak analizler yapılmış, daha sonra 6 haftalık çalışma sonunda kan örnekleri alınarak analizleri yapılıp karşılaştırılmıştır.

Çalışmada, altı hafta boyunca basketbolculara dayanıklılık antrenman programı uygulanarak kan hematoloji değerleri üzerine olan etkisi araştırıldı ve yapılan analizde şu sonuçlara varıldı. Altı hafta dayanıklılık antrenmanının sporcuların karaciğer enzimlerini düzenlediği ve depo yağlarının yakılmasını hızlandırdığı, bununla birlikte lipit oksidasyonu artırdığı tespit edilmiştir. Elde edilen sonuçlarla beraber antrenörlerin sporculara antioksidan destekli beslenme programlarını uygulamaları ve antrenman programlarında bireysel, çevresel faktörleri de göz önünde bulundurmaları önerilebilir.

Anahtar Kelimeler: Basketbol, Dyanıklılık, Kan Lipoprotein, Kan Mineral Seviyesi

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INTRODUCTION

There are many studies about how exercise affects hematological parameters. In fact, blood parameters affect the intensity and the type of exercise, exercise also affects blood parameters and it is important in terms of various blood pathologies (Guyton, 200, Hazar 2010). Physical activity requires a high level of energy. The majority of the energy in the long term exercise is obtained from carbohydrate and fat. The type of used energy depends on the intensity and duration of exercise. After long-term exercise, lactic acid occurs up to 2 or 3 times to the resting level. As the level and duration of exercise lengthen, the heart rate decreases at the same intensity of exercise. Cardiac output (CO) in trained athletes is low compared to sedentary.

Because glucose utilization increases as the intensity and duration of the exercise increases, blood glucose and insulin levels decrease. The decrease in blood glucose levels during exercise increases the glucose release from the liver with the aid of glucagon. There are findings about plasma glucagon levels are increased and the level of insulin is decreased with long-term training (Günay, 1998).

It was observed that cardiac output of athletes has increased depending on the maximum stroke volume. As a result of systematic training, the effects of exercise on the heart vary according to the kind of training.

As a result of the strength and sprint training, hypertrophy was seen in the heart muscle and a growth was seen in left ventricle volume after endurance training (Günay ve Cicioğlu, 2001).

It is known that the maximum volume of oxygen consumption and cardiac output increase, heart rate decrease and metabolically, blood lipid levels and blood lactate concentration decrease in trained person. Although the reason for these changes is not to be proved, compliance in endocrine 2 function after intense exercise programs are thought to cause these effects (Ergen et al. 2002).

MATERIALS AND METHODS

16 basketball players who are actively playing basketball have participated in this study. The attention has been paid in the absence of any changes in dietary habits of the study group throughout the study. Research group (n = 16) was implemented two groups of training randomly assigned to either continuous running or interval running. Target heart rate in the implementation of continuous running program is determined by the Karvonen method. 50-70% intensity, 6 weeks, 5 days a week, running between 25-60 minutes exercises were built to the study group. Best running degree of each athlete has been determined at the distance of 250, 400, 650 and 900 meters by the prevalent interval training program and they were asked to run as pyramidal load by adding the ratio of 60-80% to the best degrees in these distances.

Interval training program applied 1 set for first 2 weeks, 2 sets from 3. until 6. week, 3 set for last 2 weeks with the aim to adapt to the training of the research group. Both groups were built 5-10 minutes warming exercises before the start of training and 5-10 minutes cool-down exercises at the end of training.

Active resting was applied until heart rate decreased 120-130 between overloads.

Statistical Analysis, Devices Used in Biochemical Analysis and Chemicals

Refrigerated centrifuge: Jouan Mar 22.

Autoanalyser: Modular Systems, Roche Diagnostics.

Vortex: Nuva NM110.

Fridge: Arcelik.

Freezer: Jouan VX350 series Thermoelectro Corporation Revco Adjustable.

Automatic Pipettes: Eppendorf Syringes: Medset Plastic and Glass Tubes.

Biochemical parameters; (Glucose, Sodium, Potassium, Urea, uric acid, AST, ALT, LDH, triglyceride, total cholesterol, HDL-C, LDL-C, Calcium, Phosphorus, magnesium, total protein, albumin, total bilirubin) Modular measurement was performed by Roche Diagnostic Systems, Germany analyzers.

They were measured based on an enzymatic colorimetric method by using rochediagnostics kits in Modular Systems analyzer.

METHOD

This study was conducted in Ataturk University Medical Research Hospital laboratory. 16 athletes actively playing basketball participated in the study as a volunteer. Ethics committee report which was needed for the study was taken and according to this report voluntary forms were signed by athletes. When selecting volunteers, it has been noted for them to be young (age of 18-20), not have any disease, not using any drugs regularly and not being in the process of an acute illness. Approximately 10 ml blood taken from arm veins of athletes of control and research group at 09.00-09.30 am after 10-12 hours fasting and it was transferred to routine blood biochemistry tube. A portion of serum obtained from blood samples was divided for biochemical profile analysis and a portion of serum was divided for analysis of liver enzyme parameters. After waiting 30 minutes for the coagulation of blood taken for biochemistry and hormone analysis, it was centrifuged at 4000 rpm for 15 min. Then the parted serums were stored at -80º C for analysis at the end of the study.

Exercise Program

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10 minutes cool-down exercises at the end of training.

Active resting was applied until heart rate decreased 120-130 between overloads.

Table 1: Continuous Running Training Program

Training Time	Training Intensity	Training Frequency
First Week	25 min 50%	5 days/week
Second Week	30 min 50%	5 days/week
Third Week	35 min 60%	5 days/week
Fourth Week	40 min 60%	5 days/week
Fifth Week	45 min 60%	5 days/week
Sixth Week	50 min 70%	5 days/week

Table 2: Interval Running Training Program

Distance	Maximal Running Time	60%	70%	80%
250 m	40 sn	56 sn	48 sn	40 sn
400 m	64 sn	90 sn	77 sn	64 sn
650 m	114 sn	160 sn	137 sn	114 sn
900 m	165 sn	231 sn	198 sn	165 sn

Statistical Analysis

The Wilcoxon test was used for statistical comparison of differences between the measurements made before and after exercise. Mann-Whitney U test was used for the comparison of the mean of athletes' blood parameters. $p<0.05$ was considered significant as the level of error in the statistical evaluation of the results.

RESULTS

Table 3: Liver Enzyme Levels of Athletes

VAR.	N	AST (u/l)	ALT (u/l)	ALBUMİN (mg/dl)	TOTAL BIL (mg/dl)	GLUKOZ (mg/dl)	BUN (mg/dl)
BEFORE	16	32±0,7	35±3,31	4,65±0,49	0,55±0,07	76,5±7,07	15,42±1,97
AFTER	16	41±2,02*	31±1,84*	4,95±0,42*	0,65±0,21	90,5±3.53*	14,72±0,98*

***(p<0,05)**

When table 3 was analyzed it has been determined that the value of AST, ALT , TOTAL BILIRUBIN GLUKOZ, BUN after exercise.

Table 4: Blood Lipoprotein Levels of Athletes

VAR.	N	LDH (u/L)	TRIGLYCERIDE (mg/dl)	CHOLESTEROL (mg/dl)	HDLK (mg/dl)	LDLK (Mg/dl)
BEFORE	16	276,5±43,13	227±35,35	183,5±47,37	39±8,48	121±36,76
AFTER	16	267,5±30,4*	167±120,2*	180,5±51,61*	42±4,24*	93±31,81*

***(p<0,05)**

When table 4 was analyzed it has been determined that the value of LDH, TRIGLYCERIDE, CHOLESTEROL, HDLK , LDLK,after exercise.

Table 5: Mineral Levels of Athletes

VAR.	N	CA (mg/dl)	P (mg/dl)	MG (mg/dl)	NA (mEq/dl)	K (mEq/dl)
BEFORE	16	9,5±0,28	3,15±0,35	2,2±01	138,5±2,12	4,46±0,15
AFTER	16	9,6±0,14	3,25±0,49	2,2±05	139,5±3,53	4,55±0,28

***(p<0,05)**

When table 5 was analyzed it has been determined that the value of CA ,P, MG, NA ,Kafter exercise.

DISCUSSION

It is known that there will be changes in blood parameters depending on the intensity, duration and the type of exercise. Changes may occur in blood parameters during and after intense exercise due to differences such as training status, environmental conditions and nutrition (Sönmez, 2002). It has been determined through researches that regular exercises make a positive impact on all body systems and prevent health problems (Sönmez, G.T. 2002). Lipid and carbohydrate are energy sources used during exercise. Glycogen and lipid depot in muscle are limited (Zorba and Ziyagil 1995).

This study aimed to determine the effect of six-week endurance training on liver enzymes. Mashiko et al (2004) have observed significant increases in ALT and AST levels after the training program applied to athletes in 20-day camp period. Su et al (2001) have determined significant increases in ALT and AST levels at the end of the 5 week training program applied to 16 males and 8 females judoist. Osaka (2005) has indicated that there have been statistically significant increases in ALT and AST levels after acute exercise applied to 12 sedentary men whose mean age was 25.

Wu et al (2004) have reported that they had observed significant increases in ALT and AST values of ultramarathon athletes after the race. Rosmarin et al (1993) have reported that the increase in the intensity and duration of exercise provides an increase in ALT and AST levels.

Enzymes known as liver function tests are aspartate transaminase (AST) and alanine transaminase (ALT). When the hepatocyte cell membrane is damaged these enzymes mix into the blood. AST and ALT are also available in skeletal and cardiac muscle and they can rise to several times in normal by muscle damage, excessive exercise, polymyositis and hypothyroidism (Nathwani et al. 2005; Saha and Marti. 2002).

Su et al (2001) have applied 5 week training program to 16 males and 8 females judoist and eventually they have found an increase in urea levels. Mashiko et al (2004) have argued that exercise reduces the blood glucose level. If the blood glucose level falls below the normal value or rises above the normal value, hypoglycemia occurs (Günay et al 2006).

While resting, glucose is constituted by liver glycogen degradation and amino acid with the aid of glucagon. Günay and Cicioğlu (2001) have stated that glucose increases with the help of glycogenolysis, glucagon and increased release of

catecholamines from the adrenal medulla. Furthermore they have stated that the exercise intensity and duration make changes in the secretion of these hormones.

While our study showed similar results with literature in terms of the increase in ALT levels, obtained decrease in AST levels was inconsistent with the literature. The differences can be said that applied exercise program caused an increase in the permeability of the cell membrane and put cells in stress. Therefore the results of the study are important because it achieved similar results with the literature. The differences between studies may be due to the intensity, time, type of exercise, the age, gender and body fat rate of subjects, variability in performance levels and nutritional status.

The effects of physical activity on plasma lipids have been discussed in several studies (Durstine and Haskel. 1994).Sayar et al. have applied 15-20 minutes submaximal running in a day to 15 sedentary men to investigate the effect of acute and programmed exercise on serum lipoproteins. After five weeks of the program, it has been observed that exercise has had beneficial effects on serum lipoproteins but statistically significant results could not be obtained (Suter ve ark. 1994). Almost all researchers disagree that regular and continuous exercise causes change in the lipid profile more or less. A few but there are studies suggest that HDL cholesterol level is not being changed due to continuous exercise. Studies on blood lipid parameters have reported findings that triglyceride levels decreased or remained unchanged and also total cholesterol decreased or remained unchanged.

Ozhan et al (2000) have found a significant decrease in total cholesterol levels of 12 female athletes commissioned acute exercise, after 42km marathon race. After 8 weeks on the bicycle exercise, Giada et al (1995) have found no significant difference in total cholesterol levels of 24 people including 12 young and 12 old men. Gaesser and Robert (1984) have reported that the 18-week exercise program didn't make significant changes in total cholesterol levels. Tanaka (1997) has reported that no significant changes in total cholesterol levels have been determined at the end of swimming exercise applied to 18 sedentary for 10 weeks (3 days a week, 45 minutes, max 60% of VO2). It has been reported in a controlled-randomized study conducted on young women, independent of exercise intensity, exercise done by sufficient frequency (5 days in a week) increases HDL-K (Duncan et al. 1991).

It has been demonstrated in many studies those who exercise regularly have lower cholesterol levels compared to those who not exercise (Tran and Weltman, 1985; Cardoso et al. 1995, Brownel et al. 1982).

Some of the important physiological krol minerals for athletes are considered as muscle contraction, normal heart rhythm, the transmission of nerve impulses, the transport of oxygen, oxidative phosphorylation, the enzyme activation, immune function, antioxidant activity, bone health and blood acid-base balance. Because most of these processes accelerated during exercise, the minerals are necessary for optimal function.

Minerals are important especially for athletes. Manore (1996) is reported that minerals play an important role in energy production, hemoglobin synthesis, maintenance of bone health, strength and adequate immune function.

In a study, it has been observed a significant decrease in magnesium concentration as a result of the analysis of blood samples taken from runners following a marathon. Not only endurance running but also cycle ergometer and swimming and treadmill exercise similar reductions in serum magnesium level have been identified (Olha et al. 1982; Rose et al. 1970). In another study, it has been revealed that physical activity has not adversely affected magnesium levels. (Lukaski, 2002).

Between literature and our study there are percent differences in blood serum levels of athletes who were engaged in intense exercise and we conclude that this may be due to the presence of enough minerals in the diet of athletes or long-term adaptation of mineral metabolism to exercise.

Conclusions and Recommendations

In this study, effects of applying endurance and interval training program for six weeks on blood hematology parameters of basketball players have been investigated. The following conclusions have been achieved in the analysis:

- It has been determined that the value of AST value was 32±0,7 before exercise, 41±2,02 after exercise; the value of ALT was 35±3,31 before exercise, 31±1,84 after exercise; the value of ALBUMIN was 4,65±0,49 before exercise, 4,95±0,42 after exercise; the value of TOTAL BILIRUBIN was 0,55±0,07 before exercise, 0,65±0,21 after exercise; the value of GLUCOSE was 76,5±7,07 before exercise, 90,5±3,53 after exercise and the value of BUN was 15,42±1,97 before exercise, 14,72±0,98 after exercise.
- it has been determined that the value of LDH was 276,5±43,13 before exercise, 267,5±30,4 after exercise; the value of TRIGLYCERIDE was 227±35,35 before exercise, 167±120,2 after exercise; the value of CHOLESTEROL was 183,5±47,37 before exercise, 180,5±51,61 after exercise; the value of HDLK was 39±8,48 before exercise, 42±4,24 after exercise and the value of LDLK was 121±36,76 before exercise, 93±31,81 after exercise.
- it has been determined that the value of CA was 9,5±0,28 before exercise, 9,6±0,14 after exercise; the value of P was 3,15±0,35 before exercise, 3,25±0,49 after exercise; the value of MG was 2,2±01 before exercise, 2,2±05 after exercise; the value of NA was 138,5±2,12 before exercise, 139,5±3,53 after exercise and the value of K was 4,46±0,15 before exercise, 4,55±0,28 after exercise.

As a consequence, it has been found that six weeks of endurance training held liver enzymes of athletes and accelerated the burning of the fat depot. In addition, it increased the lipid oxidation. It has been recommended that trainers should apply antioxidant supported nutrition programs for athletes in this period and trainers may have an increase in the performance of athletes by taking into consideration of the individual and environmental factors in training programs.

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