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Full Length Research Paper

Comparison of blood lipids, blood pressures and left ventricular cavity dimension between soccer players and non-athletes

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In this study, it was aimed to compare and investigate the effects of regular exercise on blood lipids, blood pressure and left ventricular cavity dimensions function between soccer players and non athletes in football players. This study consisted included a total of 30 subjects, including an experimental group including 18 soccer players footballers who were training on a regular basis at least 2 h a day, 3 days a week, for 5 years and a control group including 12 sedentary individuals with similar age and same gender who were not interested in sports. Total cholesterol (TC), triglyceride (TG) and fasting blood glucose (FBG) levels, systolic blood pressure (SBP), diastolic blood pressure (DBP), left ventricular systolic diameter (LVSD), and left ventricular diastolic diameter (LVDD) were measured and evaluated in both groups. The measurements revealed that mean systolic blood pressure (SBP) levels of soccer players footballers were significantly lower than control group (p<.05) and that mean left ventricular systolic diameters (LVSD) and left ventricular diastolic diameters (LVDD) of soccer players footballers were significantly higher than control group (p <.05). As a result, long-term effect of regular physical exercises may be responsible for the favorable effects on left ventricular cavity dimensions function.

Key words: Exercise, soccer football players, blood lipids, blood pressure, left ventricular cavity dimensions function.

INTRODUCTION:

The heart is exposed to morphologic changes, including increased wall thickness and left ventricular cavity dimension as a result of long-term physical training. These changes can occur both anatomically and biochemically. Known fundamental changes are the growth of heart muscle, decrease in resting heart rate, and increase in stroke volume. Left ventricular hypertrophy may also develop in an individual training for a long time. This hypertrophy varies according to the type of sport and the intensity of the training (Foxs et al., 1998; Fagard, 2003; Pellica et al., 1999). Sports are typically classified according to the intensity level (low, medium, high) of dynamic (isotonic, aerobic) or static (isometric, anaerobic) exercise needed to perform that sport during competition (Olgun et al., 2006). Dynamic exercise causes left ventricular volume overload and static exercise causes left ventricular pressure overload (Zdravkovic et al., 2010).

Participation in sports that require high dynamic (endurance) or static power re-shapes the heart of an athlete. The degree of physiological changes may vary depending on the type of sport. An increase occurs

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Table 1. Anthropometric characteristics of soccer players and sedentary controls.

Parameter	Soccer players (n=18) (Mean ±S.D)	Controls (n=12) (Mean ±S.D)	P
Age (years)	22.62±1.78	22.08±1.24	0.415
Height (cm)	175.88±6.24	175.83±8.52	0.491
Body weight (kg)	69.77±7.11	65.91±11.04	0.787
BMI (kg/m^2)	22.54±1.85	21.21±1.85	0.134

**P<0.05
Data are given as mean±SD

in left ventricular mass and the diameter of the cavity in sports that require high dynamic power soccer. There is also an increase in left ventricular mass and the diameter of the cavity in endurance sports, whereas sports requiring power cause an increase in left ventricular mass, but no change occurs in the diameter of the cavity (Olgun and Özer, 2006)

Soccer is a sport branch requiring a combination of various functional features. Speed, strength, agility, flexibility, muscular endurance and coordination are factors that play a role in performance. Proportion of energy systems in soccer is estimated to be 60% alactic anaerobic, 20% lactic anaerobic and 20% aerobic. Regular soccer trainings lead to an increase in left ventricular wall thickness (Akgün, 1994; Smith et al., 1994; Hazar and Koç, 2003; Günay and Cicioglu, 2001).

The aim of this work was to evaluate the changes in the Blood lipid profile, blood pressure and left ventricular function levels in a group of soccer players Details of the Lipid profile and measurements of blood pressure and left ventricular function are provided.

MATERIAL AND METHODS

Subjects

While the experimental group consisted of 18 soccer players who were training on a regular basis at least 2 h a day, 3 days a week, for the last 5 years, the control group included 12 sedentary participants with similar age and same gender who were not active in any sports. League and success level of soccer players should be explained. After explaining all details of the study to the subjects and reading WMA Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects, voluntary participation forms were signed. Approval of the ethics committee was obtained for the study. The subjects were not allowed to do any exercise and receive vitamins for three days preceding the survey and care was taken so that the subjects were subjected to the same diet program. All subjects were warned to cease oral intake 3 h before testing.

Measurement methods

While ages of experimental group, and control group participated in the study were determined, the heights were measured by means of a stadiometer with 0.1 cm precision and the weights were measured with a digital scale with 0.01 kg precision. Venous blood samples were taken into tubes containing EDTA for the measurement of blood lipid levels. Total cholesterol (TC), triglyceride (TG), and fasting blood glucose (FBG) levels were determined on a Hitachi 704 auto-analyzer using commercial kits released from Behringer Mannheim. Systolic and diastolic blood pressure values were measured using a stethoscope and sphygmomanometer. Left ventricular systolic diameter (LVSD), and left ventricular diastolic diameter (LVDD) were measured in parasternal long axis view using M-mode echocardiography.

Measurements of blood lipid levels were performed in "Biochemistry Laboratory at Harran University Research Hospital and echocardiographic measurements were conducted at cardiology outpatient clinic of the same hospital.

Statistical Analysis

In this study, the arithmetic means (X) and standard deviations (SD) were calculated to detect difference in changes in the measurement results of the experimental group and control group, and Mann-Whitney U-test was used to demonstrate whether there is a statistically significant ($p<0.05$) difference between the arithmetic means in independent groups. Statistical analyses were performed using SPSS 11.0 for Windows package software.

RESULTS

The mean age, height and weight of subjects in the experimental group and control group were presented in Table 1. There was no significant difference between study groups in terms of these parameters. Lack of difference between these measurements was found to be significant for more objective evaluation of blood lipids, blood pressure and echocardiographic findings. The measurements revealed that mean systolic blood pressure (SBP) levels of the experimental group were significantly lower than that of controls ($p<.05$) and that mean left ventricular systolic diameters (LVSD) and left ventricular diastolic diameters (LVDD) of the experi-mental group were significantly higher than that of controls ($p<.05$). The difference in mean diastolic blood pressure (DBP), total cholesterol (TC), triglyceride (TG) and fasting blood glucose (FBG) levels between the experimental group and control group subjects were found

Table 2. Lipid levels in soccer players and sedentary controls.

Parameter	Soccer players (n=18) (Mean ±S.D)	Controls (n=12) (Mean ±S.D)	P
Triglyceride (mmol/ l)	76.66±34.54	63.20±8.34	0.792
Total cholesterol (mmol/ l)	123.40±8.35	125.00±23.11	1.000
Fasting blood glucose	90.00±5.74	87.80±3.56	0.841

**P<0.05
Data are given as mean±SD.

Table 3. Blood pressure and cardiac levels in soccer players and sedentary controls.

Parameter	Soccer players (n=18) (Mean ±S.D)	Controls (n=12) (Mean ±S.D	P
Systolic BP (mm Hg)	98.66±9.15	109.54±12.73	0.041**
Diastolic BP (mm Hg)	69.37±9.28	73.18±8.44	0.422
LVEDD (mm)	52.11±4.48	48.50±4.42	0.035**
LVESD (mm)	33.00±2.54	30.00±3.27	0.027**

**P < 0.05. Data are given as Mean±SD.
LVEDD (Left ventricular diastolic diameter) LVESD (left ventricular systolic diameter).

to be not statistically significant (Tables 2 and 3).

DISCUSSION

In this study, it was found that the difference in mean total cholesterol (TC), triglyceride (TG) and fasting blood glucose (FBG) levels between the experimental group and control group were found to be not statistically significant.

When systolic and diastolic blood pressures of the subjects in the experimental group and control group were compared, a significant difference was founded decrease was recorded in systolic blood pressure, whereas the difference in diastolic blood pressure values was not found to be statistically significant.

The results of SBP and DBP measurements in our research were consistent with the published studies on the subject. Ciloglu and Peker (1999) have identified that low intensity aerobic exercises performed 4 days a week for 6 weeks reduce systolic and diastolic blood pressures.

Gökdemir et al. (2007) in their study of 8-week aerobic training in 30 university students, consisting of 15 students in the experimental group and 15 students in the control group, found a significant difference between pre and post-test results.

Dawson (1993) found that exercising at 75 to 85% of maximum heart rate for 45 min three days a week for a period of 16 weeks causes a decrease in SBP and DBP in men at risk of coronary heart disease. Van Zant et al., (1993) found that significant reductions in SBP occur after exercising at 60 to 80% of maximum heart rate in 20 min for 12 weeks.

Consequently, the long-term endurance training leads to some reductions in blood pressure Thus, heart works more economically and the blood pressure decreases with decreasing resistance to blood flow. There is a reduction in blood pressure levels after a specific period of training in individuals with normal or even high blood pressure (hypertension) In addition, aerobic exercises (endurance) are known to be more effective on blood pressures than strength exercises. Given the principle of that stamina trainings between 4 and 6 weeks reduce blood pressure levels by 5 to 10%; the values obtained as a result of our study confirms this principle (Günay and Cicioglu, 2001)

In our study, we have detected that the relevant sport activity in soccer players who exercise regularly causes significant changes in echocardiographic left ventricular systolic and diastolic diameters. Our results were consistent with other studies on the subject. There are significant differences that will support the echocardiographic studies (Pavlik et al., 2001; Dencker et al., 2009). In several studies, changes in the structure of the heart have been reported to be more frequently observed in endurance sports. In addition, this variation is observed in the anaerobic sports. Regular and intensive exercises cause an increase in the volume of the left ventricular wall. Exercise have been determined to increase the left ventricular thickness up to 16 mm. Left ventricular hypertrophy can be both physiological and pathological (Olgun and Ozer, 2006; Kavak et al., 2006; Ferst and

Chaitman, 1984). All these physiological changes seen in the cardiac structure of people who do sports are called as athletes' heart (Fagard, 2003). Otag and Otag (2011) in their echocardiographic study on wrestlers found that the left ventricular wall thickness in wrestlers were significantly higher than sedentary subjects.

Zydravkovic et al. (2010), in their study on 12 to 13 years old soccer player boys, found a higher left ventricular diastolic diameter in soccer players than sedentary group. Tanriverdi et al. (2005) have found statistically significantly higher left ventricular systolic diameters in athlete group than controls. In our study, similar to these studies, left ventricular systolic and diastolic diameter of soccer players were significantly higher than sedentary group.

In conclusion, it can be said that long-term effect of regular physical exercises has a positive effect on systolic blood pressure, left ventricular systolic and diastolic diameters in soccer players. However, we believe that further studies are needed on this issue.

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