

Echocardiographic Findings in Professional Wrestlers

V Sobhani¹, S Vahedi², B Farahani³, E Ali Bakhshi¹

¹Exercise Physiology Research Center, Baqyatallah University of Medical Sciences, Tehran, ²Physical Medicine and Rehabilitation Research Center, Tabriz Medical Science University, Tabriz, ³Tehran University of Medical Sciences, Tehran, Iran

Background: Cardiac changes caused by different types of physical exercise have been reported by many studies. The aim of this study was to compare the cardiac parameters among wrestlers and control subjects by two-dimensional echocardiography.

Methods: In this study, 32 wrestlers registered in an adult team of a wrestling club and competed in national wrestling league were selected. The control group included 30 age-matched students with normal level of activity. All subjects underwent at rest M-Mode echocardiography. The parameters determined and compared consisted of the interventricular septal thickness, left ventricular internal diameter (LVID) in diastole, ejection fraction (EF), left ventricular mass (LVM), posterior wall thickness (PWT), and left ventricular hypertrophy (LVH).

Results: The mean values of LVID (50.3 ± 5.3 VS. 46.8 ± 5.3 mm), LVM (219.7 ± 50.7 VS. 166.8 ± 44.2 gr), PWT (10.1 ± 1.4 vs. 8.6 ± 1.3 mm), and the frequency of LVH (34.4% vs. 13.3%) were significantly higher in wrestlers compared with those of the control group; however, there was no significant difference between interventricular septal thickness and ejection fraction in either groups.

Conclusions: The present study showed that LVID, LVM, PWT and the frequency of LVH were significantly higher in wrestlers than in control subjects. This can result from regular exercise and physical activity. Increase in LVID was probably due to types of exercises in wrestlers that beside of strength training emphasis on endurance training. However, there was no significant difference between interventricular septal thicknesses.

Key words: Cardiac Parameters, Two-Dimensional Echocardiography, Wrestlers

Introduction

Nowadays, it has been established that hard physical and professional exercise is accompanied by morphologic alteration and cardiac function which is known as "athlete's heart".¹ It has been shown that cardiac alterations such as bradycardia, left ventricular hypertrophy and stroke volume increase may be seen in athletes who exercise for long times.² Intensity of morphologic alterations depends on type of exercise.^{3,4} Several echocardiography studies performed on athletic or non-athletic individuals reveal that subjects doing dynamic exercises like short or long distance running develop ventricular enlargement.^{5,6}

On the other hand, athletes in static or resis-

tance sports seem to have thicker ventricular walls and slightly enlarged or normal left ventricle dimensions.⁷ Presumably, echocardiography must be the best non-invasive way to investigate left ventricular hypertrophy. It is important to differentiate these physiological changes from similar cardiac structural diseases such as cardiomyopathy. Cardiac alterations have been the subject of many studies ever since they were associated with different types of sport such as football,⁸ ice hockey,⁹ basketball,¹⁰ soccer,¹¹ and running.¹² However, to our knowledge cardiac changes arising from wrestling, an Iranian traditional sport, has been the subject of limited studies. The aim of present study is to measure and compare parameters associated with cardiac alterations by two-dimensional echocardiography in wrestlers and control subjects.

Patients and Methods

The present research was approved by the Re-

Correspondence:

S Vahedi

Physical medicine and rehabilitation research center, tabriz university of medical sciences, tabriz, iran
TEL: 09125830159--04113373967
Email: vahedis@tbzmed.ac.ir

Table 1. comparison of average EF, LVID in diastole phase, LVM, relative wall thickness, PWT, septal thickness, and frequency of LVH between two groups of wrestlers and control subjects. Quantities are based on scale digression \pm average or difference between them.

Variant	Wrestler N=32	Control N=30	P value
Age (year)	23.7 \pm 2.55	22.2 \pm 1.4	0.067
Weight (kilo gram)	75.9 \pm 17.2	70.47 \pm 5.4	0.116
Ejection fraction (%)	62.6 \pm 8.7	63.1 \pm 9.3	0.831
Left ventricular internal diameter (mm)	50.3 \pm 5.3	46.8 \pm 5.3	0.004
Left ventricular mass (gr)	219.7 \pm 50.6	166.8 \pm 44.2	0.001
Posterior wall thickness (mm)	10.1 \pm 1.4	8.6 \pm 1.3	0.001
Septal thickness (mm)	10.1 \pm 1.5	9.6 \pm 1.7	0.208
Left ventricular hypertrophy (%) numbers	11(34.4%)	4(13.3%)	0.049

EF: Ejection fraction; LVID: left ventricular internal diameter; LVM:left ventricular mass; PWT:posterior wall thickness

search center and the Medical ethics committee of Tehran University of Medical Sciences, and comprised 32 wrestlers (13 freestyle and 19 Greco-Roman wrestlers) and 30 control subjects. The wrestlers were chosen from professional members of national wrestling league who regularly participated in contests. The eligibility criteria included a minimum period of 3 years of regular exercises 3 times a week and each lasting at least 1 hour. Control subjects were chosen from a group of aged-matched male and healthy students of Tehran University of Medical Sciences with normal range of activities and no previous history of heart and other diseases. Individuals with histories of cardio-respiratory diseases, hypertension, diabetes, neuromuscular disorders or any other systematic diseases were excluded from the study. Medical histories were taken from all individuals under study before undergoing electrocardiography and physical examinations. Therefore, all wrestlers and control subjects underwent at rest M-Mode two-dimensional (IRIS, Sigma 440 Kontron) echocardiography examinations. Echocardiographic parameters measured were as follows:

1. Left ventricular wall thickness,
2. Left ventricular internal diameter in diastole,
3. Ejection fraction by echocardiography,
4. Left ventricular mass (LVM) calculated by Penn-Cube formula

$$LVM = 1.04([LVID + PWT + IVST]^3 - LVID^3) - 13.6 \text{ g}$$
5. Posterior wall thickness,
7. Left ventricular hypertrophy was defined as septum thickness > 10.1 mm or posterior wall thickness > 10 mm.

Thirty two professional wrestlers and 30 age-

matched medical students were selected. For average comparison of quantitative variants between two groups, independent samples t-test, and for the frequency of comparison of qualitative variants, Chi-square test was applied using SPSS Chicago. IL.USA. edition, 15. P value \leq 0.05 was considered as statistically significant.

Results

The subjects under study were all males, aged from 19 to 30 years (23.0 \pm 2.2), and weighed between 55 and 105 kg (73.4 \pm 13.1 kg). The average comparison of ejection fraction(EF), left ventricular internal diameter (LVID) in diastole phase, left ventricular mass(LVM), posterior wall thickness(PWT), septum thickness and frequency of left ventricular hypertrophy (LVH) of wrestlers and control groups are shown in Table 1.

According to our findings, an average LVID (50.3 \pm 5.3 vs. 46.8 \pm 5.3 mm, P=0.004), LVM (219.7 \pm 50.7 vs. 166.8 \pm 44.2 gr, P=0.001), PWT (10.1 \pm 1.4 vs. 8.6 \pm 1.3 mm, P=0.001) and frequency of LVH (34.4% vs. 13.3%, P=0.049) were significantly higher in wrestlers than in those of control group. However, no difference was found between average ejection fraction and septum thickness in two groups.

Discussion

According to the findings of our study, all subjects under study were males with average age variation of 23.0 \pm 2.2 years. Mean of age in Arab wrestlers who was studied by Chukwuemeka et al.²¹ was 22.3 \pm 4.8 years. In addition, LVID of wres-

tlers (50.3 ± 5.3 mm) in our study was significantly higher than that of control group (46.8 ± 5.3 mm). Whereas, Chukwuemeka et al.²¹ proved that the average LVID in a group of Arab wrestlers did not differ from normal people. MorganRoth et al.⁵ also found normal average LVID in those wrestlers taking isometric exercises. In our study mean of LVM in wrestlers group was significantly higher than that of control subjects.

MorganRoth et al.⁵ showed that LVM increased in wrestlers group (330 to 348 gr). Cohen et al.¹⁴ discovered that LVM in wrestlers and runners at rest was higher than in control group (311.8 & 325.9 gr vs. 215 gr). Present study displayed that average of posterior wall thickness in wrestlers group was significantly higher (10.1 ± 1.4 mm) compared with control group (8.6 ± 1.3 mm).

MorganRoth et al.⁵ also discovered that left ventricular wall thickness increased in wrestlers (13 to 14 mm). Chukwuemeka et al.²¹ showed that in wrestlers group, average posterior wall thickness was much higher than control group (11.2 ± 0.8 vs. 9.6 ± 1.1 mm). Cohen and et al.¹⁴ also proved that increase in LVM in wrestlers was mostly due to the posterior wall thickness (12.9 vs. 10.1 mm). Our study showed that frequency of LVH in wrestlers group was found to be significantly higher than of control group (34.4% vs. 13.3%). Kinoshita et al.¹⁷ also discovered LVH in 9% of recently starting Sumo wrestling males.

According to our study no significant difference was found between two groups, in respect of average ejection fraction and septum thickness. However, Chukwuemeka and his group showed that average septum thickness in wrestlers group was meaningfully higher than that of control group

(12.1 ± 2.0 vs. 10.2 ± 2.9 mm). Cohen and colleagues also found increasing LVM in wrestlers in comparison with control subjects which was mostly relevant to interventricular septal thickness (13.5 vs. 9.1 mm). Kinoshita and his colleagues¹⁷ indicated that left ventricular septal thickness in 331 Sumo wrestling athletes was about 10.3 ± 0.9 mm. In present study, interventricular septal thickness was 10.1 ± 1.5 mm but compared with control, the difference was not statistically significant. In this study, left ventricular hypertrophy was determined by echocardiograph scales. However, Kinoshita et al used ECG to establish left ventricle hypertrophy in 890 men who began Sumo wrestling professional exercises with sensitivity of 36% and specificity between 70 to 99% . According to our results, LVID, LVM, PWT and LVH in wrestlers were higher which may be due to the type of exercises in wrestlers that beside of strength training emphasis on endurance training. Consistent with previous findings no significant difference in interventricular septal thickness was found between two groups which could be due to the types of exercises. In this connection, it is recommended to study echocardiography parameters such as interventricular septal thickness and LVID in relation to current sports in Iran namely Weight lifting, Taekwondo and Judo. Such investigation is also warranted in regard to ethnic communities.

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