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Assessment of the left ventricle in adult athletes

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ABSTRACT

Competitor's heart is a set of constructions and physiological alteration that correlate to a long period of sport. The lack of reference to this status may lead to be classified as a disease, this study intended to evaluate morphological and functional changes in left ventricular in male athletes. One hundred and thirty-one intact participants between 15-33 years were involved in this research, 31 of them act as a control subject, echocardiographic scan was done to find left ventricular internal end-diastolic dimension, interventricular septal wall thickness, left ventricular posterior wall thickness, relative wall thickness, left ventricular mass and ejection fraction for two groups of athletes (aerobic & anaerobic) and non-sports group (control), analysis was conducted using SPSS (Statistical Package for the Social Sciences). Athlete's average parameters were higher than those of the control were; end diastolic dimension (51.5±4.8mm versus 48.0±4.4mm), interventricular septal wall thickness (9.7±1.05mm versus 8.4±0.9mm), posterior wall thickness (9.5±0.85mm versus 8.4±0.6mm), relative wall thickness (0.40 ±0.08mmversus 0.35±0.05mm), left ventricular mass (191.1±37.2g versus 141.1±36.4g) and ejection fraction (70.6±5.3 versus 66.5±4.5). There was a significant difference between athletes and the control participants concern to all measurements. Results of the study are compatible with earlier findings; this data will be benefit into medical evaluation purpose in the sporty society.

1. Introduction

A living without diseases is the people basics. Therefore, all efforts made to fight sickness to prevent it from happening instead of treatment processes (Khatun and Bandyopadhyay, 2016).

Physical activity was classified in sets according to some factors, included exist of oxygen, and type of exercise, the new alterations of the heart tissue differ relying to the activity kind (Lavie et al., 2001).

Exercise for long periods and regularly leads to the occurrence of structural and functional changes in the organs of the body in general and the heart in particular, which requires adaptation of the body with it (Shihab et al., 2016). Most of researchers focused their efforts In study the changes occur in the heart of sport person (Rawlins et al., 2009). The increase in the dimensions of the left ventricle is a feature of the heart in practitioners' sports (Engel et al., 2016). In the twentieth century, it has been identified on the strong correlation between the human body measurements and achievement (Prakash and D'Souza, 2016). Today, echo represents the best choice of heart imaging (Elkhader et al., 2014), by using its capacity of detecting anatomy, physiology and pathology of the heart were progress, especially with three –dimension (D'Andrea et al., 2015). Only few studies have evaluated the changes in the left ventricle after exercise in different groups of athletes (Legaz et al., 2005).

2. Materials and methodology

This a Case-Control Study includes a sum of one hundred participants aged 15-33 years who practiced various types of sports(50 bodybuilding as anaerobic and 50 swimmers as aerobic), thirty-one healthy males, free from any heart and other diseases similar age and unsporting represented the control set. Sufficient information and unwritten approval were collected before carrying out ultrasound scan. All procedures and research aims were illustrated to participants and their data kept in full confidentiality Echocardiography examination

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was achieved using Aloka SSD-5000 ultrasound system, with 2.5 MHz UST-5297 Phased probe. Ultrasound was done in the recumbent position, the probe was put between ribs; move in various directions to get suitable images. Distinguishing movement differentiated return waves; frontal and backward motions indicated left ventricular contraction and dilatation, Respectively (Elkhader et al., 2014).

The following measurements have taken from echocardiographic examination:

1- LV end diastolic dimension, mm (LVEDD)
2- Interventricular septal wall thickness, mm (IVS)
3-Left ventricular posterior wall thickness, mm (PWT)
4- Relative Wall Thickness, mm (RWT) ([IVS+ PWT]/ LVEDD)
5-Left ventricular mass,g (LV mass) (ASE method) (Eq. 1)

$$=0.8(1.04([LVEDD+PWTD+IVSTD]3-[LVEDD]3))+0.6g. \quad (1)$$

6- Ejection fraction (%) (Simpson rule) (Eq.2)

$$EF(\%)=[(EDV-ESV)/EDV]x100 \quad (2)$$

Significance of this study was examined by using *t* test.

3. Results

Primary information for both athletes and control displayed was shown in Table 1. Body mass index of participants was higher in athletes' participants than control.

Echo values of the left ventricle of subjects and controls demonstrated in Table 2. There were considerably higher and a notable variation in all Lv parameters [LVEDD, IVS , PWT, RWT, LV mass and the ejection fraction of the sportsperson in comparison to non-sportsperson (controls)].

In the athletes the utmost value of LVEDD was 62 mm. More than 58mm found in three athletes.

There was a remarkable variation between aerobic and anaerobic athletes with respect to all Lv parameters except relative wall thickness and ejection fraction which did not represent a significant difference (P>0.05).

4. Discussion

Sports have many benefits for people in their daily lives in terms of their contribution to develop of physical fitness, the social aspect and the functionality of the individual (Merkel, 2013).

Human body measurements and the features of heart and its blood vessels for athletes is one of the fundamentals of the coaching and effective factor for excellence, as stated in the study carried out by Kyselovičová et al. (2016).

The dominant characteristic of the heart of the sports person is a functional increase in size. There is a distinct enlarge in the dimensions of the left ventricle for practitioners of sports, compared with the control group. In this study 11 of 100 athlete participants show an increase in left ventricle end-diastolic dimension (<58mm).

Table 1: Age and BMI of participants

variable	Athletes (n=100)	Control (n=31)	P value
Age (year)	22.04±3.9	20.7±4.6	0.29
BMI (kg/m^2)	23.09± 3.4	22.8±3.8	0.83

Table 2: Echocardiographic data of left ventricle

Variable	Athletes		Control
	Anaerobic	Aerobic	
LVEDD (mm)	52.8±4.6 *ʃ	50.2±5.0 Ω	48.0±4.4
IVS (mm)	10.2±1.2 *γ	9.1±0.9 #	8.4±0.9
PWT (mm)	10.0±0.9 *γ	9.0±0.8 *	8.4±0.6
RWT (mm)	0.44±0.09 *	0.41±0.07 *	0.35±0.05
LV mass(g) [ASE method]	201.8±42.4 *ʃ	180.4±32.0 *	141.1±36.4
Ejection fraction (%)	69.7±5.8#	71.4±4.8 *	66.5±4.5

Ω Significantly different from controls (p <0.05); ʃ Significantly different from aerobic Athletes (p <0.01); # Significantly different from controls (p <0. 01); γ Significantly different from aerobic Athletes (p <0.001); *Significantly different from controls (p <0. 001)

Left ventricle end-diastolic dimension, interventricular septal wall thickness, left ventricular posterior wall thickness, relative wall thickness, Left ventricular mass and ejection fraction have a considerable increase in athlete groups in compare to control persons. Reference to BMI both groups in the normal range. Numerous studies have shown the same results of the current study.

The study carried out by Venckunas detected that there is a close correlation between the increase in the size of the heart and exercise (Venckunas et al., 2011).

This study found that there were considerable differ between aerobic and anaerobic athletes in most parameters.

In comparison with ordinary mature, basketball players have grand left ventricle, a similar result was found in participants in various sport activities (Engel et al., 2016).

5. Conclusion

This research was designed to examine the effect of sport in human organs (heart), the results of this study do not go far from the preceding one. This study has exhibited important changes in left ventricle dimensions after physical exertion, such as in different researches around the world. It is necessary to differentiate normal changes from abnormal situations. Using of echocardiography system help in detecting any cardiac reconstruction due to physical activity. These outcomes should put in mind at the beginning of any new research project. Further studies, should deal with individuals of the same age, gender and race.

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