52 - DETECTION OF PHYSIOLOGICAL LEFT VENTRICULAR HYPERTROPHY IN JUDOCA ATHLETES THROUGH THE ECO-DOPPLER

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INTRODUCTION

Regular exercise causes the moderate increase in volume of the myocardium and hypertrophy, which, however, are generally nonspecific. However, such changes are directly correlated with the sport modality, time and intensity of physical training. (SHARMA et al., 2003; AZEVEDO et al., 2007).

The intense physical training performed by athletes searching to improve the performance in sports, exposes the heart to changes in cardiac function and morphological characteristics, resulting in a condition known as "athlete's heart" (STEIN et al., 2002).

The cardiovascular adaptations, functional and anatomical, triggered by intensive and prolonged physical training, allow the athlete's heart an extraordinary physical performance. Besides the type and volume of training, the adaptive heart changes should be influenced by genetic characteristics of the athlete and by his/her biological maturity (MCMULLEN; JENNINGS, 2007).

The left ventricle has a normal cavity up to 55 mm and may have a wall thickness of 12 mm. However, studies show that these parameters are found in most athletes. Of the athletes aged 18 to 35, 1 / 3 show the left ventricular cavity with greater than 55 mm and only 5% show that change greater than 60 mm (AZEVEDO et al., 2007; SHARMA et al., 2003). As for the thickness of the ventricular wall, only 2% have changes greater than 12 mm (PELLICIA et al., 1991).

Thus, the "athlete's heart" presents a variety of morphological and functional changes resulting from vigorous and systematic physical training, with the aim of improving the function of the heart as a pump and increase the capacity of the cardiovascular system, delivering oxygen to exercising muscles. The "athletic heart" features, as characteristics, on one hand, increased cardiac output, increased final diastolic dimension of the left ventricular cavity, increased ventricular parietal thickness, increased ventricular mass and volume of the brain and, on the other, the decrease in resting heart rate, in the conduction and ECG changes (MCMULLEN;JENNINGS, 2007).

Left ventricular hypertrophy is defined as an increase in left ventricular mass. This increase may be secondary to an increase in ventricular wall thickness or cavity size, or they develop as a compensatory or adaptive process representing the pressure overload and / or volume (MONTERO; CONDE; POPKIN, 2007).

Hypertrophic cardiomyopathy is caused by a genetic abnormality that produces a disturbance in the growth of muscle fibers of the heart, characterized by left ventricular hypertrophy. It is the most common cause of sudden death in people under 30 years of age, including competitive athletes (MEDEIROS et al., 2006). It occurs in response to various stimuli, including hypertension, valvular disease, myocardial infarction and genetic mutations (MCMULLEN; JENNINGS, 2007).

The aspect that makes the distinction between hypertrophic cardiomyopathy and the "athletic heart" is the diastolic function: normal in the athlete and impaired in the evolution of hypertrophic cardiomyopathy. Among the victims of sudden death, 1% are adults with hypertrophic cardiomyopathy and 2% to 4% are children and adolescents. It may present left ventricular hypertrophy and / or right, and the asymmetric septal hypertrophy (obstructive) being the most common, followed by non-obstructive (asymmetric septal, apical, concentric or side-to-back). In the athlete, the septal thickness is 12 mm. Above 16 mm refers to the pathology and between 12 mm and 16 mm refers to a demarcated area that needs to be better understood (GHORAYEB et al., 2000; OLIVEIRA, 2002, MEDEIROS et al., 2006).

Studies have found that Doppler echocardiography is the test most currently applied in the diagnosis and therapeutic orientation of Left Pathological Ventricular Hypertrophy, as a method with greater precision and provides characterizations and decisive clarification of the pathophysiological mechanisms involved, with important therapeutic and prognostic implications (GINEFRA et al., 2003; CASINI et al., 2006).

The potential of ventricular remodeling of the "athletic heart" is still a subject of considerable debate. Ventricular hypertrophy as a physiological adaptation, without pathological consequences in athletes, has been widely questioned (MCCANN; MUIR; HILLIS, 2000)

The ability to distinguish between the physiological changes associated with the "athletic heart" and the structural abnormalities that may represent underlying cardiac disease is of paramount importance. This study aimed to determine the incidence of signs of "athlete's heart" in judo, differentiating it from Hypertrophic Cardiomyopathy, and compare the anthropometric and echocardiographic variables.

MATERIALS AND METHODS

We conducted a cross-sectional study consisted of a sample of 40 judo athletes, whites, from a national championship, selected randomly, and that met the inclusion criteria: age between 18 to 25 years, male, with at least three years of professional training and who had signed the Instrument of Consent. The study was conducted after approval of the Ethics in Research of the University Center of Anápolis-UniEvangélica, under protocol n º 148/2008.

The athletes were submitted to the examination of Echo Doppler (ATL, model Ultramark 9 HDI), as well as a body assessment, which included the following aspects: the percentage of fat obtained by the prediction equation to estimate the minimum weight for wrestlers of Lohman (1981), using a caliper Sanny, accurate to 0.1 mm (sub-scapular, triceps and abdominal), height, obtained by the Seca stadiometer accurate to 0.1 cm, body mass, achieved by an analog platform scale Welmy, with a maximum load of 150 kg and 100 g precision, and the BMI. All anthropometric evaluation and of body composition

were performed in the laboratory of physical evaluation of the UniEvangélica - LAFE.

The morphological and functional assessment of the heart was performed by Echo Doppler examination (ECO), by a cardiologist specialized in the area. All examinations were performed in the CLINICOR (Doctors and Therapists Affiliates) and in the laboratory ECHOS - Center Echocardiography and Vascular Duplex Scan. The electrodes were placed at three points of the chest and, with the individual seated in the lateral position, lying on his left arm, under a bed suitable for this examination. The records of the Eco Doppler were performed at rest and without the use of drugs, following the guidelines of the American Society of Echocardiography (HENRY; DEMARIA; GRAMIAK, 1980). The athletes who were identified with characteristics of "athletic heart" were named Group 1 and those who did not present such features were named Group 2.

The statistical test of Mann-Whitney was used to compare differences between the two groups for the anthropometric and echocardiographic variables, adopting a significance level of 5% (0.05). The Pearson coefficient of linear correlation was used to assess the level of association between the anthropometric and echocardiographic variables. The descriptive analysis in the form of mean and standard deviation, using the software SPSS 10.0 was also used.

Statistically significant results were marked by an asterisk (*).

RESULTS AND DISCUSSION

Table 1 shows the characteristics of the 40 athletes, with four athletes (0.1 ± 1.02) showing signs of physiological left ventricular hypertrophy (athletic heart "), with cavity diameters and thicknesses ventricular increased.

Graph 1 – Report of the Eco Doppler featuring the four athletes who presented Physiological Left Ventricular Hypertrophy.

	Physiological left ventricular hypertrophy	Normal
Nº Athletes	**04**	**36**

The need to distinguish physiological hypertrophy from pathological forms has been a source of continuous assessment in recent years (TESKE et al., 2009).

The left ventricular wall thickness is the single most important characteristic that separates the left ventricular hypertrophy from the pathologic. The pattern of hypertrophy in athletes may be eccentric or concentric. The anaerobic training (strength) produces a left ventricular concentric hypertrophy, in which the wall thickness is increased in proportion to the inner diameter. Resistance training, in turn, results in an eccentric hypertrophy of the ventricle (GHORAYEB et al., 2005; MARON, 2005). We emphasize that the athletes analyzed in this study present the anaerobic training (strength) as predominant. Four of these athletes have characteristics of concentric hypertrophy of the left ventricle.

Already Sundstedt et al. (2007), studying 24 endurance athletes, did not find signs of left ventricular hypertrophy in any of them. Echocardiographic findings showed a diastolic diameter of left ventricle 53 ± 4 mm and a left ventricular mass of 198 ± 35 g.

The increase in final diastolic diameter of left ventricle (> 55 mm) is a common finding in athletes. In this study, it was found in Group 1 an average of 55.5 ± 0.58 mm. The static or isometric exercise, both a characteristic of judo, implies the development of muscle tension against resistance with little movement. However, they cause a pressure load on the heart but not in volume, resulting in concentric hypertrophy (PLUIM et al., 2000).

However, there are ongoing discussions about the real existence of concentric hypertrophy as the only clue for highly trained athletes in muscle strength. Studies found no difference in septal thickness and posterior wall of the left ventricle among high performance athletes in strength and muscular form (HAYKOWSKY et al., 2007). This study obtained different findings - 4 judo athletes had values of 12.7 ± 0.96 mm in both the thickness of the septum and the posterior wall of the left ventricle.

The cardiovascular adaptations in athletes vary according with the type of sport. The strength training is considered a static exercise. Static exercises in the course of the volume of the heart is not affected, but the overload is characterized by elevations in systolic and diastolic BP and a modest increase in cardiac output, heart rate and oxygen consumption (HOOGSTEEN et al., 2004). The high level of training is associated with sudden resistance and to a large pressure response. Such changes were observed in the athletes examined.

By comparing the differences in echocardiographic variables between athletes who had "athletic heart" and those who had not, it was found in the "athletic heart" group, a significant difference in the final diameter of the left ventricle, in the left ventricular mass, in the septum diastolic thickness, in the thickness LVPW diastolic (left ventricular posterior wall), in the relationship mass / body surface area, in the final diastolic volume, in the systolic volume, in the relationship volume / mass and in the final systolic volume, as shown in Table 1.

	Group 1 Signs of Athlete´s Heart (n=4)			Group 2 Do not show signs of Athlete´s Heart (n=36)	
Echocardiographic variables	Average	DP	Parameters	Average	DP
Aorta (root diameter) (mm)	30.2	±4.92	20 a 37 mm	26.8	±3.04
Left atrium (mm)	37	±2.45	20 a 40 mm	34.4	±2.86
LV Final diastolic diameter (mm)	55.5*	±0.58	35 a 55 mm	49.2	±3.09
LV Final systolic diameter (mm)	33*	±2.58	25 a 40 mm	29.5	±2.29
Septal diastolic thickness (mm)	12.7*	±0.96	07 a 11 mm	9.5	±1.28
LVPW diastolic thickness (mm)	12.7*	±0.96	07 a 11 mm	9.3	±1.17
Left atrium / aorta ratio	1.27	±0.19	1.0 +/- 0.5	1.3	±0.14
Ejection fraction – Teicholz (%)	71.5	±3.11	>60%	69.67	±6.65
Left ventricular mass (g)	327.5*	±62.67	94 a 276g	209.1	±50.12
Mass / body surface area (g/m²)	157.4*	±13.86	85.1 a 100 g/m²	117.1	±22.41
Percentage of shortening of the cavity (%)	40.5	±1.73	32.9-42.3%	40.1	±2.83
Septum / LVPW	1	0	< 1.3	1	0
Final diastolic volume (ml)	146.5*	±22.19	73 a 156 ml	115.5	±16.49
Systolic volume (ml)	96.75*	±5.62	54 a 99 ml	81.83	±12.23
Volume / mass ratio (ml / g)	0,40*	0	0.45 a 0.90 m/g	0.6	0
Final systolic volume (ml)	41*	±4.08	18 a 57 ml	34.03	±6.41

Table 1 - Shows the comparison of the average and standard deviation of the main echocardiographic variables obtained between the two groups of athletes.

*p=0,05

Martin et al. (1974) concluded that the effects of isometric exercise on left ventricular performance depends on two factors: the intensity of isometric exercise and muscle mass involved in the contraction. Spirito et al. (1994) investigated the hemodynamic responses to isometric exercise in 947 elite athletes and concluded that athletes who performed isometric exercise such as weight and wrestling, had increased myocardial mass, with or without a slight enlargement of the left ventricle. The data from this study found slight increases, not only in myocardial mass, but also in the septum diastolic thickness, in the left ventricular posterior wall and in the mass / body surface area.

Upon making a correlation of anthropometric variables with echocardiographic variables between the two groups, it was found that the percentage of shortening of the cavity is influenced by BMI and by the triceps fold, explaining that 18% of the shortening is influenced by BMI and 10% of the shortening is affected by the folds of the triceps. It was noted also that the systolic volume is influenced in 10% of the cases by the percentage of fat. However, it was evident that the rest of the echocardiographic characteristics is not dependent on anthropometric variables.

In this study, no athlete presented signs that characterized the Hypertrophic Cardiomyopathy. However, Ghorayeb et al. (2000) call attention to the athletes who are between the hypertrophic cardiomyopathy and physiologic hypertrophy, since the features that distinguish these events are not easily identified, hampering their differential diagnosis.

Recently, Pelliccia et al. (2008), upon assessing 12,880 athletes by echocardiographic and electrocardiographic examinations, identified 123 individuals (1%) with abnormal repolarization. Of those 123 athletes, 39 had, at baseline, clinical evidence of structural heart disease.

Sudden cardiac death by hypertrophic cardiomyopathy occurs disproportionately more often in black athletes (REIS; CORDEIRO; CURY, 2006), especially in football and basketball, because they are sports characterized by a high percentage of black participants. However, in other sports such as rowing and cycling, which are characterized by a high cardiovascular stress, but with less participation of blacks, such cases of sudden death are rare. It is worth noting that all athletes in this study are white.

When making the differential diagnosis between hypertrophic cardiomyopathy and the "athletic heart", there should be taken into account, according Viégas (2005), that the Hypertrophic Cardiomyopathy is a somewhat rare cardiovascular disease (0.2% -1 in 500) and can be transmitted genetically. We can assume that due to the rarity of this disease, we could not detect it in the present study, since it used a small sample of 40 athletes.

CONCLUSION

The ECO analysis showed that of the 40 athletes who underwent evaluation, 4 had left ventricular concentric hypertrophy. No athlete showed signs that characterize the Hypertrophic Cardiomyopathy. When comparing the differences in echocardiographic variables between athletes, it was found that in the "athletic heart" group, a significant difference in the final diameter of the left ventricle, in the left ventricular mass, in the diastolic septum thickness, in the LVPW diastolic thickness, in the mass / body surface area, in the end-diastolic volume, in the systolic volume, in the volume / mass and in the end-systolic volume.

Upon making a correlation of anthropometric and echocardiographic variables, it was found that the percentage of shortening of the cavity is influenced by BMI and by the triceps fold, whereas the systolic volume is influenced, in 10% of cases, by the percentage of fat. However, it was evident that the rest of echocardiographic characteristics does not depend on anthropometric variables.

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DETECTION OF PHYSIOLOGICAL LEFT VENTRICULAR HYPERTROPHY IN JUDOCA ATHLETES THROUGH THE ECO-DOPPLER

ABSTRACT

This study aimed to determine the incidence of physiological left ventricular hypertrophy in judo, differentiating it from Hypertrophic Cardiomyopathy, and compare the anthropometric and echocardiographic variables. A cross-sectional study was conducted, consisting of a sample of 40 judoka athletes, who underwent an examination of Doppler Echo, as well as a body assessment, which included the following aspects: the fat percentage, height, body mass. The nonparametric statistical test of Mann-Whitney was used and the coefficient of linear correlation of Pearson was used to assess the level of association between the anthropometric and echocardiographic variables. It was used, also, the descriptive analysis in the form of medium and standard deviation, using the software SPSS 10.0. Of the 40 athletes, four athletes (0.1 ± 1.02) showed signs of physiological left ventricular hypertrophy (athletic heart "), with cavity diameters and ventricular thicknesses increased. By comparing athletes who presented physiological left ventricular hypertrophy and those who did not, it was found in the group with physiological left ventricular hypertrophy a significant difference in the final diameter of the left ventricle, in the left ventricular mass, in the diastolic septum thickness, in the diastolic thickness of LVPW (ventricular posterior wall), in the relation mass / body surface area and in the final diastolic volume, systolic volume, the volume / mass and end-systolic volume. It was found that the percentage of shortening of the cavity is influenced by the BMI and by the triceps fold, explaining that 18% of the shortening is influenced by the BMI and 10% of the shortening is influenced by the fold of the triceps. It was concluded that four athletes presented left ventricular concentric hypertrophy. When making a correlation of anthropometric and echocardiographic, it was found that the percentage of shortening of the cavity is influenced by the BMI and by the triceps fold, whereas the systolic volume is influenced in 10% of cases, by the percentage of fat.

KEY - WORD: left ventricular hypertrophy; judo; athletes ;Doppler Echo.

DÉTECTION DE L'HYPERTROPHIE VENTRICULAIRE GAUCHE PHYSIOLOGIQUE CHEZ LES ATHLÈTES JUDOKAS PAR LE BIAIS DE L'ÉCO DOPPLER.

RÉSUMÉ

La présente étude a eu comme objectif de vérifier l'incidence de l'hypertrophie ventriculaire gauche physiologique chez les judokas, en le différenciant de la Cardiomyopathie Hypertrophique, et compare les variables anthropométriques et écocardiografique. On a réalisé une étude transversale, constitué d'un échantillon de 40 athlètes judokas, qui ont été soumis à l'examen d'éco doppler, aussi à une évaluation corporel, qui inclut les aspects suivant : le pourcentage de graisse, la stature, la masse corporelle. On a utilisé le teste statistique non paramétrique de Mann-Whitney et le coefficient de corrélation linéaire de Pearson a été utilisé pour évalué le niveau d'association entre les variables anthropométriques et écocardiografique. On a aussi utilisé l'analyse descriptive, sous la forme de moyenne et de courbe de Gauss, en utilisant le logiciel SPSS 10.0. Des 40 athlètes, 4 athlètes (0,1 ± 1,02) ont présenté des signaux d'hypertrophie ventriculaire gauche physiologique (" cœur de athlète "), avec un diamètre cavitaire et une épaisseur ventriculaire augmentées. En comparant les athlètes qui ont présenté une hypertrophie ventriculaire gauche physiologique et ceux qui n'en ont pas présenté, nous avons vérifié dans le groupe qui a de l'hypertrofie ventriculaire gauche physiologique qu'il y a eu une différence signifiante dans le : diamètre final du ventricule gauche, dans la masse ventriculaire gauche, dans l'épaisseur diastolique du septum, dans l'épaisseur diastolique du PPVE (parois postérieure du ventricule), dans la relation volume/superficie corporel, dans le volume diastolique final, dans le volume systolique, dans la relation volume/masse et dans le volume sistolique final. On a constaté que le pourcentage de raccourcissement de la cavité est influencé par l'IMC et par le pli du triceps, expliquant que 18% du raccourcissement sont influencés par l'IMC et dans 10% du raccourcissement est influencé par le pli du triceps. Nous concluons que 4 athlètes ont présenté une hypertrophie concentrique du ventricule gauche, en faisant une corrélation des variables anthropométriques et écocardiografiques, nous avons constaté que le pourcentage du raccourcissement de la cavité est influencé par l'IMC et par le pli du triceps, à mesure que le volume systolique est influencé dans 10% des cas, par le pourcentage de graisse.

MOTS CLÉ: l'hypertrophie ventriculaire gauche; judokas; athlètes; l'éco doppler.

DETECCION DE HIPERTROFIA VENTRICULAR IZQUIERDA FISIOLOGICA EM ATLETAS DE JUDO ATRAVES DE ECO-DOPPLER

RESUMEN

El presente estudio objetivó verificar la incidencia de hipertrofia ventricular izquierda y fisiológica en atletas de judo, diferenciándolo de la cardiopatía hipertrófica, y comparar las variables antropométricas y eco cardiográficas. Se realizó en estudio transversal constituido de una muestra de 40 atletas de judo que fueron sometidos al examen de eco-doppler, tal como una evaluación corporal que incluyó los siguientes aspectos y el porcentaje de gordura, estatura, masa corporal. Fue utilizado el test estadístico no para métrico de Mann-Witney y el coeficiente de correlación linear de Pearson fue utilizado para evaluar el nivel de asociación de las variables antropométricas y eco cardiográficas. Se utilizó también análisis descriptivas, bajo la forma de medida y desvíos patrón, utilizándose el software SPSS 10.0. de los 40 atletas , siendo que 4 atletas (0,1=- 1,02) presentaron señales de hipertrofia ventricular izquierda fisiológica ("corazón de atleta"), con diámetros de cavidad y espesuras ventriculares aumentadas .Al comparar los atletas que presentaron hipertrofia ventricular izquierda fisiológica y los que no presentaron, se verifico en el grupo con hipertrofia ventricular izquierda fisiológica que hubo diferencia significativa en: diámetro final de ventrículo izquierdo en la masa ventricular izquierda de la espesura diastólica do septo, en la espesura diastólica de PPVE (pared posterior del ventrículo), en la relación masa/superficie corporal, en el volumen diastólico final, en el volumen sistólico en la relación volumen masa y en volumen sistólico final. Se constató que el porcentaje de acortamiento de la cavidad influenciada por el IMC y por el pliegue del tríceps explicando que el 18% de la disminución influenciado por IMC y en 10% de la disminución por el pliegue del tríceps. Se concluye que 4 atletas presentaron hipertrofia concéntrica y eco cardiográfico se constató que el porcentaje de la disminución de la cavidad influenciada por IMC y por el pliegue del tríceps, al paso que el volumen sistólico influenciado en 10% de los casos por el porcentaje de grasa.

PALABRAS CLAVE: hipertrofia ventricular izquierda; judo; atletas; eco-doppler.

DETECÇÃO DE HIPERTROFIA VENTRICULAR ESQUERDA FISIOLÓGICA EM ATLETAS JUDOCAS ATRAVÉS DO ECO-DOPPLER.

RESUMO

O presente estudo objetivou verificar a incidência de hipertrofia ventricular esquerda fisiológica em judocas, diferenciando-o da Cardiomiopatia Hipertrófica, e comparar as variáveis antropométricas e ecocardiográficas. Realizou-se um estudo transversal, constituído de uma amostra de 40 atletas judocas, que foram submetidos ao exame de Eco Doppler, bem como a uma avaliação corporal, que incluiu os seguintes aspectos: o percentual de gordura, estatura, massa corporal. Foi utilizado o teste estatístico não paramétrico de Mann-Whitney e o coeficiente de correlação linear de Pearson foi utilizado para avaliar o nível de associação entre as variáveis antropométricas e ecocardiográficas. Utilizou-se também a análise descritiva, sob a forma de média e desvio padrão, utilizando-se o software SPSS 10.0. Dos 40 atletas, sendo que 4 atletas (0,1± 1,02) apresentaram sinais de hipertrofia ventricular esquerda fisiológica ("coração de atleta"), com diâmetros cavitários e espessuras ventriculares aumentadas. Ao comparar os atletas que apresentaram hipertrofia ventricular esquerda fisiológica e os que não apresentaram, verificou no grupo com hipertrofia ventricular esquerda fisiológica que houve diferença significativa no: diâmetro final do ventrículo esquerdo, na massa ventricular esquerda, na espessura diastólica do septo, na espessura diastólica do PPVE (parede posterior do ventrículo), na relação massa/superfície corporal, no volume diastólico final, no volume sistólico, na relação volume/massa e no volume sistólico final. Constatou que o percentual de encurtamento da cavidade é influenciado pelo IMC e pela dobra do tríceps, explicando que 18% do encurtamento são influenciados pelo IMC e em 10% do encurtamento é influenciado pela dobra do tríceps. Conclui-se que 4 atletas apresentaram hipertrofia concêntrica do ventrículo esquerdo, ao se fazer uma correlação das variáveis antropométricas e ecocardiográficas, constatou-se que o percentual de encurtamento da cavidade é influenciado pelo IMC e pela dobra do tríceps, ao passo que o volume sistólico é influenciado em 10% dos casos, pelo percentual de gordura.

PALAVRAS-CHAVE: hipertrofia ventricular esquerda; judô; atletas; Eco Doppler.