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ORIGINAL ARTICLE

Effect of exercise in dog's Fractional shortening

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ABSTRACT

Heart ultrasonography is used in veterinary diagnostic imaging. One use of echocardiography is estimated fractional shortening index. In this study, we selected ten dogs with mix bred and these animals were studied before and after exercise by standard echocardiography operations and heart fractional shortenings were calculated in short view at the end systole and end diastole positions. Results of this study, shows that no different of with means of this index and the exercise cannot be significant change in dog's Fractional shortening.

Key words: Dog, Echocardiography, Exercise, Fractional shortening

Introduction

Ultrasonography considered as one of the accurate and appropriate diagnostic methods in diagnostic imaging which have wide usage in human medicine and veterinary medicine. One of the most important imaging method is heart ultrasonography that in this technique using ultrasonographic waves [1,3,5,17]. Ultrasonography of the heart (echocardiography) is an imaging method accepted worldwide in cardiac diagnostics. While one and two dimensional Echocardiography has been employed in human medicine in the late 1960s and in veterinary medicine began in late 1970s [10,22]. Years after, its application was developed quickly and with the emergence of modern machines big step was taken in developing this technique [22]. Echocardiography is considered as one of the issues in veterinary diagnostic imaging [4,5,22]. Ultrasonography is been use in understanding the performance of cardiovascular system diseases diagnosis. [2,8,22,23]. Echocardiography in the diagnosis system structure and heart diseases in humans are used [13,20]. Echocardiography techniques also are used in the veterinary medicine [5,11,17]. One use of echocardiography is calculating the fractional shortening index of the heart that is used in veterinary and there is a standard model for the estimation of it [3,4,8,22]. Nowadays, these techniques are used to evaluate anatomical and functional cardiovascular system [3,8,11,20]. Echocardiography as a technique in performance evaluation of heart has created a revolution in cardiology that substituted of invasive diagnostic techniques such as cardiac catheterization and Angiography in diagnosis of congenital and acquired heart diseases. In heart ultrasonography, blood cavities such as ventricles have hypoechoic appearance (dark) that covered by hyperechoic areas (light). For example, in ventricles that separated from each other by hyperechoic wall [8,22]. In two-dimensional imaging, has introduced two views: first is *Long Axis* which is parallel with heart longitudinal axis and includes dorsoventral surface of body, second is *Short Axis* which is Perpendicular to the heart longitudinal axis and or is perpendicular to the heart or dorsoventral surface of body. One of the important characteristics and applications of

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ultrasonography in heart function is assessment of fractional shortening that can be use also in dogs [2,4,22]. Amounts of fractional shortening have been rendered in normal states in various weights and even in some cases without mentioning a specific race, age and genius. In dogs, fractional shortening over 30 percent considered as normal sets [8,22]. However, this percent is affected by several factors including body weight and the animal is placed, and numbers of 28 to 45 percent is also mentioned for dogs [8]. The fractional shortening is estimated in M-mode display. To calculate the fractional shortening index, the diameter of internal cavity of left ventricle at the end of systole and diameter of internal cavity of left ventricle at the end of diastole are measured. Obtained numbers are located in below formula and by this mean, the fractional shortening are calculated [2,4,8,22].

$$\text{Fractional shortening} = \frac{\text{internal cavity of left ventricle at end systole -internal cavity of left ventricle at the end of diastole}}{\text{internal cavity of left ventricle at the end of diastole}} \times 100$$

Materials and methods

Six mixed breed dogs with average body weight of about approximately 20-25kg were selected. After physical restriction of animals, upper and mid one-third part of lateral thorax surface, between 3 to 7 right intercostal space, after washing, mentioned areas were cleaned and studied. In this study weren't used of chemical material to restriction of animals because these materials have negative effect on heart markers. Animal under study were recumbented to the right on a special perforated table. Then by preparation of site with a Pie Medical ultrasonography machine, operation of two- dimensional in B-mode on third to seventh right intercostal space were done. In standard right view, by M-mode performance model in site were regulated and by fixation of appropriate image, required measurements by special tools were done. 5-7.5 MHz Curved array Probe in echocardiography approaches contact with ultrasound gel and with the sliding movements, the heart and the outline of the study area were identified in B-mode system. In especial proper position, we have activates M-mode system of the device. To wit when we observed proper position, M-mode coupled with B-mode pressed to creation in adjacent two images. To correct measurement, M-mode index must be located in proper situation. In this study, the diameter of internal cavity of left ventricle at the end of systole and diameter of internal cavity of left ventricle at the end of diastole are measured. Achieved data are occupied in formula and by this mean fractional shortening are calculated. After capturing appropriate images, animals forced to running. After exercise, heart rate was assayed and in tachycardia situations animal rapidly were restrained physically and ultrasonographic operations were done (Fig 1). Capturing was done by Xing player and analyzing the images was done by Scion image software. Data analysis was done by T-test and SPSS ver. 17.

Results and discussion

Obtained data are showed in tables 1 and 2.

Mean value of internal cavities of left ventricle at end of the diastole in pre-exercise dogs were 3.78±0.17 cm and in post-exercise dogs were 3.83±0.19 cm that there wasn't observed significant difference among them (P>0.05). Mean value of internal cavities of left ventricle at end of the systole in pre-exercise dogs were 2.50±0.14 cm and in post-exercise dogs were 2.51±0.14 cm that there wasn't observed significant difference among them (P>0.05).

Fig. 1: An example of images obtained

Discussion:

Ultrasonography considered as one of the accurate and appropriate methods in diagnostic imaging which have wide usage in human medicine and veterinary medicine [2,5,10,12,20]. Current study is present one of the most important usages of echocardiography and fractional shortening index in dogs and effect of exercise on this index. One of the echocardiography usage is calculating the fractional shortening which is present information about heart performance and is very common in veterinary medicine [3,8,9,11]. Obtained data from echocardiography can be used in diagnosis of arrhythmias. In this study, the possibility of obtaining images in M-mode and B-mode of all dogs from the right side with brief angle change and rotation of transducer by standard echocardiography methods was possible. Also, the probe placement in a lying state in the space between sternum and costochondral junction is best opportunity to evaluate cardiac cavities because in this position heart Placement in

near and more contact with the chest that this finding is compatible with reports of other researchers [5,11,12,17]. In all under studying dogs, use of a 5-7.5 MHz Curved array transducer the possibility of obtaining images with excellent quality from the right chest was possible that is consistent with other researchers result [2,4,22]. In M-mode method should be careful to be sure that the marker of it correct placement in two-dimensional view and perpendicular to the ventricular septum until acquire picture are not bigger, not smaller than real sizes. Also, if not making the transducer at its correct angle during imaging, taking fringing likely there will may be mistakes that these findings are similar to related reports [4,17,23]. Should be noted that there is differences in echocardiographic dimensions in different breeds of dogs and may be exist varieties in their fractional shortening. Due to the correlation between heart weight and dog's size should be tried to selection dogs which are equiponderant [8,22]. Calculated numbers in this study about normal range of fractional shortening are compatible with data presented in references [2,20,23]. In comparison of mean value of internal cavities of left ventricle at end of the systole and diastole in pre-exercise and post-exercise dogs also in comparison of fractional shortening in both groups there wasn't observed significant difference (P>0.05).

Findings with some reports in human that says internal cavities of left ventricle at end of the diastole after exercise increases, have offered no attunement [11,16]. One of this phenomenon causes maybe is short duration time of exercise. The findings of other studies about left ventricle at end of the diastole diameter with some accomplished researches that not reported certain changes in this parameter after exercise is attunement [7,15]. Achieved results of this study are compatible with some researches that in researches weren't reported any significant changes in fractional shortening after exercise [6,21,24,26]. But isn't consistent with human reports that reported there is a fractional shortening after exercise [11,18,19]. One of its reasons can be refer to less time of exercise and involvement of other parameters. In horse also echocardiography after exercise revealed that there is a little relative fractional shortening in horses in high speeds [14]. Of curse in other study has been mentioned that there is a decrease in horse fractional shortening with increasing the internal cavities of left ventricle [25]. Finally, this study presented that there isn't effective relationship between exercise and fractional shortening. Finally, in this study revealed that exercise hasn't effect on fractional shortening that is compatible with several findings.

Table 1: obtained data of pre-exercise in M-mode. Data are presented per centimeter.

Animal NO.	diameter of internal cavity of left ventricle at the end of diastole	diameter of internal cavity of left ventricle at the end of systole	Fractional shortening
1	3.7	2.4	35.13
2	3.5	2.3	34.28
3	3.8	2.5	34.21
4	4.0	2.7	32.5
5	3.8	2.5	34.21
6	3.9	2.6	33.33

Table 2: obtained data of post-exercise in M-mode. Data are presented per centimeter.

Animal NO.	diameter of internal cavity of left ventricle at the end of diastole	diameter of internal cavity of left ventricle at the end of systole	Fractional shortening
1	3.8	2.4	36.84
2	3.5	2.4	31.48
3	3.8	2.5	34.21
4	4.1	2.8	31.7
5	3.9	2.5	35.89
6	3.9	2.5	35.89

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