ELECTRO CARDIOGRAPHIC, RADIOGRAPHIC AND BLOOD PRESSURE CHANGES IN DOGS WITH DILATED CARDIOMYOPATHY

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Abstract

The present study was conducted in twenty-five dogs of different breeds presented to the University Veterinary Hospital and TVCC, Mannuthy with the complaints of cough, dyspnoea, exercise intolerance, weight loss, ascites, depression, lethargy, weakness, cyanosis and syncope. They were subjected to detailed clinical examination. Investigations included electrocardiography, radiography and blood pressure measurement.

Key words*: syncope, dyspnoea*

Cardiac diseases in dogs need to be studied extensively for their prompt diagnosis at early stages. Cardiomyopathies were defined as diseases of the myocardium which led to cardiac dysfunction or failure. It was classified based on different pathophysiological or etiological and pathogenic factors (Dukes-McEwan *et al.,* 2003). Dilated cardiomyopathy was the second most common cause of cardiac disorders in dogs with high rate of morbidity and mortality especially in giant breed dogs. It was characterized by systolic dysfunction and progressive enlargement of ventricles, atrium or both (Srinivasan and Krishna, 2008; Soares *et al.* 2010).

Materials and methods

This present study was carried out in the Department of Veterinary Clinical Medicine, Ethics and Jurisprudence, College of Veterinary and Animal Sciences, Mannuthy, Kerala Veterinary and Animal Sciences University, during the period July, 2015 to July, 2017. The study was conducted in apparently healthy and clinical cases of dogs with cardiomyopathies presented to the small animal medicine unit of University Veterinary Hospital and Teaching Veterinary Clinical Complex, Mannuthy. Standard single channel six-lead ECG was recorded by using the BPL-CARDIART-6108-T ECG machine and interpreted (Tilley *et al.*, 2008). Thoracic radiography in two orthogonal views, *i.e.* left lateral and dorso-ventral was performed on all dogs at initial presentation by using SIEMENS Multiphos 15, Version: 3.0 computed radiography supported with

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the Carestream Image suite software. All radiographs were evaluated for the evidence of pulmonary congestion and oedema, pleural effusion and heart size by Vertebral Heart Scale. 'Vertebral Heart Scale tool' of Image suite software was used to measure the VHS proposed by Buchanan and Bucheler (1995). After assuring the comfort of animal in sternal recumbency, non-invasive blood pressure (NIBP) was measured by using BP-Accuagard Oscillometric digital blood pressure apparatus at heart base level. Cuff size – 40 percent of the circumference of the leg was used over the front leg palmar digital artery. The first inflation artefact was avoided by advising the owner to apply intermittent palm pressure over cuff area and then three successive readings were taken and the average values were recorded (Terry, 2008).

Results and discussion

Out of twenty-five cases with dilated cardiomyopathy showed prominent ECG findings of sinus tachycardia (68 per cent), atrial fibrillation (20 per cent) and ventricular premature complexes (20 per cent)were recorded. Electrocardiographic findings included increased P-wave duration (40 per cent), increased P-wave amplitude (4 per cent), low voltage QRS complexes (8 per cent) and increased R amplitude (24 per cent). Segment ST changes like ST coving (24 per cent), ST depression (20 per cent) and ST elevation (8 per cent). Common electrocardiographic findings observed in a retrospective study of 369 dogs affected with DCM were atrial fibrillation (AF) of 45 per cent followed by ventricular premature complexes (VPCs) (31%) and supraventricular premature complexes (SVPCs) atnine per cent. Atrial fibrillation was the most prominent finding seen in wide variety of large and giant breed dogs like Irish wolfhounds, Great Danes, Newfoundlands and Saint Bernards. Ventricular Premature Complexes (VPCs) were most common in Boxers and Dobermans. Supraventricular Premature Complexes were most commonly seen in boxers and German shepherd dogs (Martin *et al.*, 2009).

Thoracic radiography of dogs with dilated cardiomyopathy revealed cardiomegaly (92 per cent), pulmonary oedema (76 per cent), pleural effusion (24 per cent), left atrial enlargement (8 per cent) and elevation of trachea and carina (4 per cent).In a retrospective study, the most common clinical signs reported in 369 clinical cases of DCM were breathlessness (67%), cough (64%), exercise intolerance (48.8%), weakness (39.2%), reduced appetite (35.7%), weight loss (30.2%), collapse (26%), dullness and lethargy (20%). They also found that clinical presentation of animals varied with different breeds. However, most of the breeds were presented predominantly with the sings of breathlessness and coughing. Boxers were mainly affectedwith the signs of collapse (70%); poor appetite (60%) in Golden retrievers; exercise intolerance and weakness in German shepherd dogs, Great Danes, Saint Bernards and Irish wolfhounds (Martin *et al.*, 2009).Vertebral heart score in dogs with dilated cardiomyopathyare given in table 1.

The mean ± SE values of VHS for control group was 9.96±0.10cm.The VHS was increased in group II (11.24±0.17cm) when compared to control group. In group II, statistically significant ($p \leq 0.01$) increase was noticed in the mean values of VHS in dogs with dilated cardiomyopathy.

Lamb *et al.* (2000) concluded that VHS could be used to raise clinical suspicion of heart disease in addition to history and other physical examination findings.Lister and Buchanan (2000) reported that vertebral heart scale was used to determine cardiomegaly in borderline

Table 1. Vertebral heart score (VHS) in dogs with dilated cardiomyopathy

Radiographic findings	Group I Control (apparently healthy animals) (n=20)	Group - II Dilated cardiomyopathy (n=25)	t-value	p-value
Vertebral Heart Score (VHS) cm	9.96±0.10	11.24±0.17	6.123**	<0.001

*-significant at $p \leq 0.05$ and ** significant at $p \leq 0.01$ ns: non-significant at 0.05

cases with minimal radiographic changes and quantification of the progression of cardiomegaly over a period.Lamb *et al.* (2001) recorded the normal vertebral heart score in the lateral radiograph of healthy Labrador Retrievers (10.8 vertebrae). They found that the precision of VHS measurements for the diagnosis of cardiac disease varied with the breed.The mean ± SE values of blood pressure are presented in Table 2.

Table 2. Blood pressure in control and clinical cases of dilated cardiomyopathy

Blood pressure (mmHg)	Group I Control (Apparently healthy animals) (n=20)	Group - II Dilated cardiomyopathy (n=25)	t-value	p-value
Systolic	116.60±1.63	131.36±1.29	7.170**	<0.001
Diastolic	87.05±0.92	81.16±1.45	3.420**	0.001
Mean arterial pressure	96.85±0.66	97.84±1.09	0.770ns	0.446

*-significant at p≤0.05 and ** significant at p≤0.01 ns: non-significant at 0.05

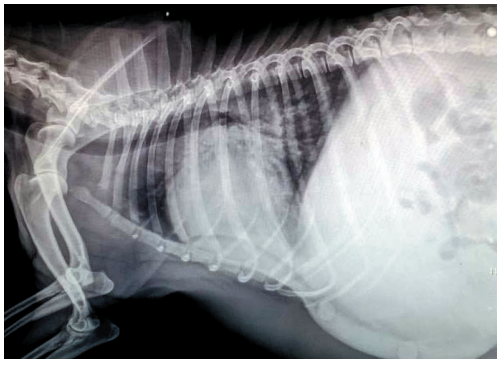

Fig. 2

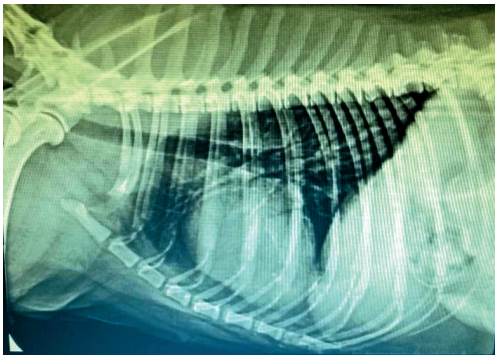

Fig. 2.1

Fig. 2 and 2.1: Lateral radiographic projection showing cardiomegaly in DCM cases

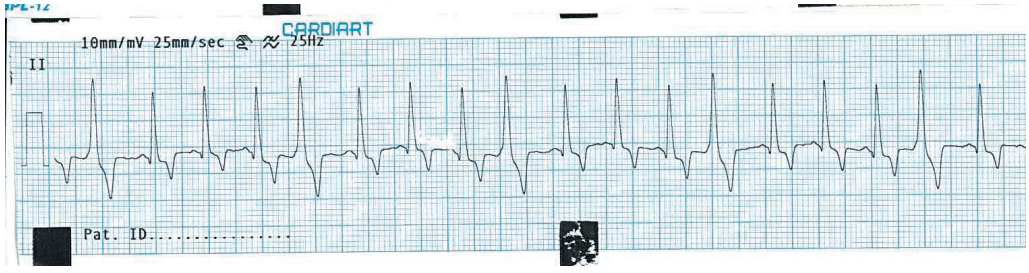

Fig. 1. Atrial fibrillation

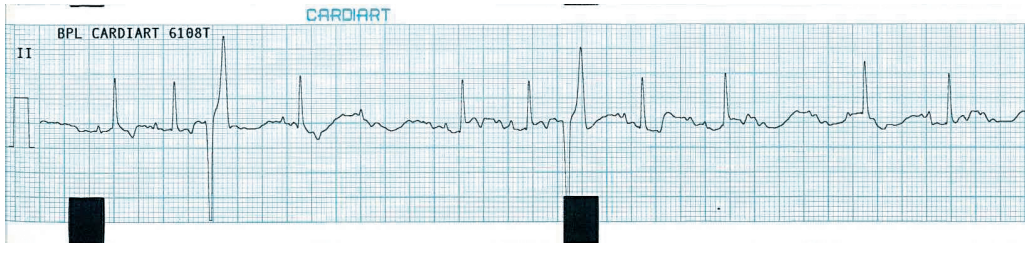

Fig. 1.1. VPCs.

Fig. 1 and 1.1: Lead II ECG of a dog with dilated cardiomyopathy

In group II, statistically significant increase was noticed in the mean values of systolic blood pressure ($p \leq 0.01$) and significant decrease was noticed in the mean values of diastolic blood pressure ($p \leq 0.01$).No significant differences were observed in the mean ± SE values of mean arterial pressure in group II dogs, when compared to that of the control group.

Average systolic and diastolic blood pressure in healthy animals were 144 and 81mmHg respectively (Anderson and Fisher, 1968). In Labrador retrievers, normal diastolic, systolic and mean arterial blood pressure recorded by doppler method were 69.2mmHg, 121.3mm Hg and 91.2 mmHg respectively and in case of giant breeds were 67.1mmHg, 121.3mm Hg and 90.5mmHg respectively. Diastolic, systolic and mean arterial blood pressure recorded in dogs with cardiac diseaseswere 77.9mmHg, 136.4mmHg and 101.4mmHg respectively (Bodey and Michell, 1996).In small animal practice, non-invasive measurement of blood pressure was considered as standard diagnostic procedure (Henik *et al.*, 2005).

In the current study, significant increase invertebral heart score (VHS) was significantly increased in dogs with DCM confirms structural changes of heart. It might be due to dilatation of all chambers in DCM. Atrial fibrillation and ventricular premature complexes (VPCs) were the life threatening arrhythmias reported in dogs with DCM.

References

Srinivasan, S. R. and Maheshkrishna, M. 2009. Dilated Cardiomyopathy and its Management in Dog. *Intaspolivet*. **9:** 333-338.

Tilley, L.P., Smith Jr, F.W.K., Oyama, M.A. and Sleeper, M.M.2008.Electrocardiography. In: Manual of Canine and Feline Cardiology. (4th Ed). Saunders Elsevier, Missouri: pp 49-77.

Dukes-McEwan, J., Borgarelli, M., Tidholm, A., Vollmar, A.C. and Haggstrom, J. 2003. Proposed guidelines for the diagnosis of canine idiopathic dilated cardiomyopathy. *J. Vet. Cardiol.***5**: 7–19.

Soares, E.C., Pereira, G.G., Petrus, C.L., Neto, M.L., Yamaki, F. and Larsson, M.H.M.A. 2010. Survival and echocardiographic evaluation of dogs with idiopathic dilated cardiomyopathy treated with carvedilol. *Arq. Bras. Med. Vet. Zootec.* **62**(3): 555-56.

Buchanan, J.W. and Bucheler, J. 1995. Vertebral scale system to measure canine heart size in radiographs. *J. Am. Vet. Med. Assoc.* 206:194-199.

Terry, D.F. When and how to take blood pressure? Interpretation? In: *Proceedings of the LAVC Latin American Veterinary Conference; October, 3rd to 6th, 2008. Lima Peru*. pp2-7.

Martin, M. W. S., Stafford Johnson M. J. and Celona, B. 2009. Canine dilated cardiomyopathy: a retrospective study of signalment, presentation and clinical findings in 369 cases. *J. Small. Anim. Pract*., **50**: 23–29.

Lamb, C.R.,Tyler, M., Boswood, A., Askelly, B.J. and Cain, M. 2000. Assessment of the value of the vertebral heart scale in the radiographic diagnosis of cardiac disease in dogs. *Vet. Rec.* 146:687-90.

Lamb, C.R., Wikeley, H., Boswood, A. and Pfeiffer, D. U. 2001. Use of breed specific ranges for the vertebral heart scale as an aid to the radiographic diagnosis of cardiac disease in dogs. *Vet. Rec.*148(23):707-11.

Lister, A.L. and Buchanan, J. W. 2000. Vertebral scale system to measure heart size in radiographs in cats. *J. Am. Vet. Med. Assoc.* 216:210-214.

Anderson, L.J. and Fisher, E.W. 1968. The blood pressure in canine interstitial nephritis. *Res.Vet. Sci.* 9:304-313.

Bodey, A.R. and Michell, A. R. 1996. Epidemiological study of blood pressure in domestic dogs. *J. Small Anim. Pract.*37:116-125.

Henik, R.A., Dolson, M.K. and Wenholz, L.J. 2005. How to obtain blood pressuremeasurement? *Clin. Tech. Small Anim. Pract.* 20:144-150. ■