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Occurrence of DCM in a Young Labrador Retrievers: Diet and Inheritance as Prognostic Factors

G. Saritha*, K. Vignatha, Bhavishya, Preethiram and S. Brunda

Department of Veterinary Medicine CVSC SVVU, Tirupati, India

**Corresponding author*

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A B S T R A C T

Dilated Cardiomyopathy (DCM) in young dogs, specifically around 2 years of age, is an atypical but increasingly documented occurrence. While DCM has traditionally been considered a disease of middle-aged to older dogs (typically 4–8 years), recent research and veterinary alerts have highlighted its presence in younger Labrador Retrievers, often linked to either specific genetic predispositions or nutritional factors. Tenmale Labrador retriever dogs aged between 1-3 were presented to the veterinary clinical complex, college of Veterinary science, Tirupati with clinical symptoms of exercise intolerance, panting heavily, weakness, lethargy, coughing during night times, rapid and heavy breathing, abdominal distension, sudden fainting often observed. Anamnesis include deworming and vaccination done on regular basis, all the dogs were maintained indoors and on home food without much supplements. Haemato biochemical examination revealed merely normal values. On radiographic examination biventricular enlargement, globoid appearance elevated trachea and VHS levels ranged between 11.3-13.5. Electrocardiography showed elevated R wave, deep Q wave with bradycardia and VPCs. Echocardiography examination revealed reduced ejection fraction, fractional shortening with increased LVIDd and LVIDs. The dogs were treated with Enalpril @0.5mg/kg BWT, spironolactone@0.5mg/kgbwt BID for 15 days (for ascites cases), tab. strongbeat BID for 30 days. DCM in young dogs is often inherited and dietary related especially when dogs were maintained exclusively on home diet. Definitely there might be taurine deficiency and which can be reversed by including the taurine in diet. Research needs to be done on the influence of inheritance on occurrence of DCM in younger dogs.

Introduction

In a demographic study of various cardiac diseases, Labradors were found to have the highest occurrence of cardiac disease among the breeds studied (27.2%). Notably, the occurrence of cardiac disease in dogs aged 1 to 3 years was approximately 17%, showing that while less common than in older dogs, it is a significant clinical reality for young adults.

Materials and Methods

The present investigation was carried out at VCC, college of Veterinary Science, tirupati, Andhra Pradesh. Ten male Labrador dogs with the manifestations such as clinical symptoms of exercise intolerance, panting

heavily, weakness, lethargy, coughing during night times, rapid and heavy breathing, abdominal distension, sudden fainting often observed. Anamnesis include deworming and vaccination done on regular basis, all the dogs were maintained indoors and on home food without much supplements.

Electrocardiography was performed on right lateral recumbancy using BPL Cardiart 1608 and whereas the radiographic evaluation was done on left lateral and ventro - dorsal exposures using Siemens X-ray unit. Blood samples were collected for complete blood count, serum biochemical profile and thyroid profile. Canine heart worm was detected by heartworm antigen test using Agen CHW® kit. Cardiac ultrasonography was performed using Ixos vet ultrasound / Doppler machine supplied by Esoate Pie Medicals, Netherlands.

Following echocardiographic aspects were studied using a micro convex Array C5-2 R13 cardiac probe:

M-Mode Echocardiography

Transthoracic echocardiograms were obtained with the unsedated dogs on right lateral recumbancy. Access to the right side of the thorax was facilitated by use of a table with a special cut-out to allow the transducer to be directed upward towards the site of maximal cardiac pulsation as suggested by Allworth *et al.,* (1995). Transducer was located parasternally between right third and sixth intercostals between sternum and costochondral junction (Thomas *et al.,* 1994).

M-Mode Measurements

M-mode recordings were taken at the high papillary level. Measurement of left ventricular dimension at end–diastole (LVEdD) and at end–systole (LVEsD) was made intraluminally from the trailing edge of the septal wall image to the leading edge of the ventricular free wall. End–diastolic and end–systolic measurements of the thickness of the Inter Ventricular Septum (IVSd, IVSs) and left Ventricular Posterior Wall (LVPWd, LVPWs) were made using trailing edge. Further, Ejection fraction (EF) and Fractional Shortening (FS) were also obtained.

End point septal separation (EPSS) was measured from the point of maximal cranial motion of the cranial mitral valve leaflet (E point) to the interventricular septum during the rapid–filling phase of diastole. All the measurements were made in millimeters. Further, pulsed wave Doppler and colour flow Doppler studies were also attempted in order to assess the mitral valve insufficiency and regurgitation as per the technique suggested by Dominique and Marc-Andre (2008).

Results and Discussion

Haemato biochemical examination revealed merely normal values.

The mean haematological parameters of total erythrocyte count, haemoglobin, total leukocyte count and differential count were well within the normal range. The mean creatine kinase MB (70.8 ± 0.34 U/L) and lactate dehydrogenase (138.18 ± 1.24 U/L) levels were higher than the normal ranges of 24.26 ± 0.14 U/L and 72.45 ± 0.28 U/L respectively. Other serum biochemical parameters (total serum proteins, albumin, aspertate amino transferase and cholesterol) were with in the normal range. No abnormality was detected with the values of T3, T4 and TSH. Test for heartworm antigen was also negative.

Electrocardiographic abnormalities include increased R and P wave amplitude, ventricular premature complexes, ventricular tachycardia, deep Q wave, ST coving, wide and bizarre QRS complexes. Thoracic radiography revealed cardiomegaly with globoid appearance (fig. 1). Whereas, abdominal radiograph in dogs with pendulous abdomen revealed ground glass appearance and loss of overall visceral detail, consistent with ascites. Abdominal ultrasonography also revealed anechoeic area in the abdominal cavity with floating viscera suggestive of fluid accumulation.

2-D echocardiograpy of DCM dogs revealed globose heart with dilated ventricles and/or atria on short axis view (fig.2). Whereas, m-mode echocardiography revealed thin interventricular septum (IVS), left ventricle posterior wall (LVPW) with increased internal diameter of the left ventricle both at diastole and systole (fig. 3). The left ventricle dimensions at end diastole (LVEdD) and systole (LVEsD) values of the DCM dogs (before treatment) were 57.17 ± 0.58 and 49.67 ± 0.57; 56.57 ± 0.87 and 49.59 ± 1.38 mm, respectively that were significantly increased ($P<0.01$) when compared to the mean values of healthy dogs (41.98 ± 0.39 and 34.55 ± 0.49 mm). These dimensions after therapy (by day 90) decreased significantly ($P<0.05$). The other dimensions viz., LVPWd, LVPWs, IVSd, IVSs and EPSS noted on

day 0 were significantly (P<0.05) decreased and increased, respectively. Following therapy (on day 90) a non-significant increase in the dimensions of LVPWd, LVPWs, IVSd, IVSs with a non-significant decrease in EPSS was noticed. With respect to Ejection Fraction and Fractional Shortening, the values on day 0 were significantly (P<0.01) low when compared to healthy dogs. However, a significant (P<0.05) increase in these values were recorded following therapy (Table 1 and fig. 4).

Fig.1 B-Mode echocardiography showed dilated left ventricle

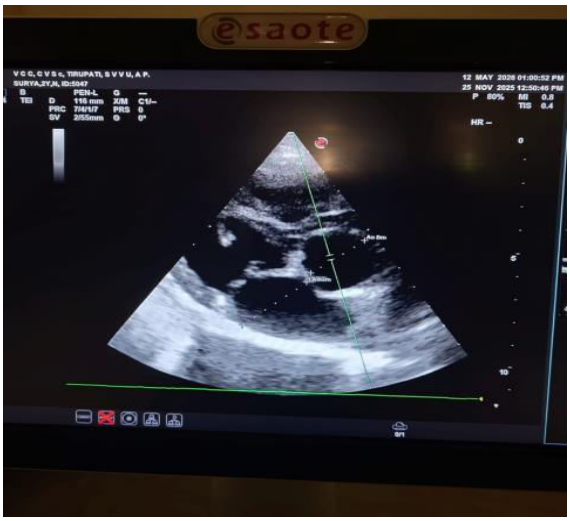


Fig 2 M-mode echocardiography showed dilated left ventricle and thin interventricular septae and posterior wall (diastole and systole)

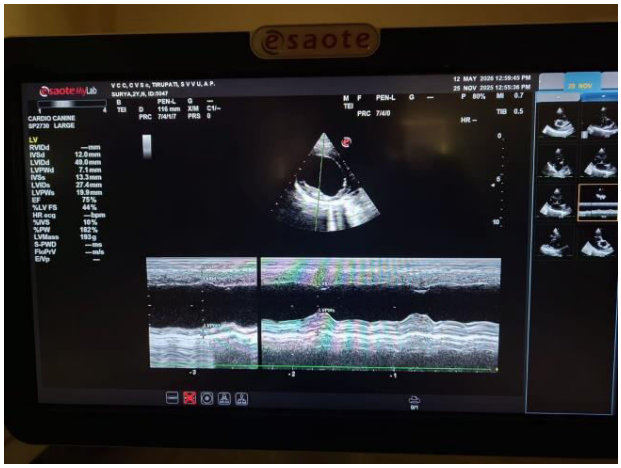


Fig 3 ascitic fluid in abdominal cavity

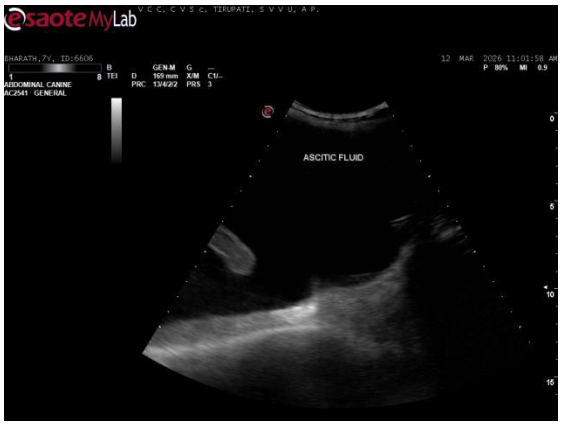
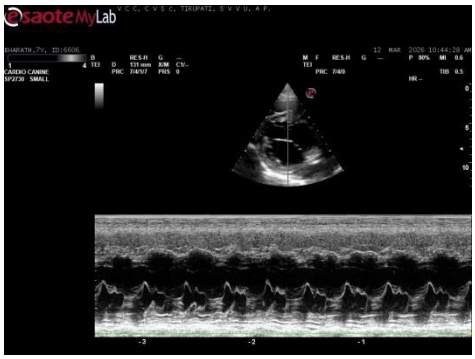


Fig 4 DCM dog showed increased EPSS value



Based on the echocardiographic, radiographic and electrocadiographic findings, the condition was diagnosed as dilated cardiomyopathy. All the dogs started clinical improvement from day 3 to 5. The crackles and murmurs that had been auscultated were diminished in intensity, less frequent cough and the amount of ascitic fluid and pedal edema was noticed declining from day 5. However, the owners of the respective group dogs were advised to continue enalapril for 90 days. After therapy no appreciable changes in heart size on thoracic radiographs were noticed except absence of pulmonary edema. Similarly except absence of arrhythmias, no difference in ECG was detected. Whereas, left ventricular dimensions in both the groups improved by day 90 when compared to day 0, along with a significantly (P<0.05) different LVEdD and LVEsD values between the groups, that were treated using Angiotensin converting enzyme inhibitors (enalapril)

DCM in dogs can be diagnosed well in advance by radiography after detection of cardiac murmur, exercise intolerance. Normally DCM is common in older dogs,

but recent studies and observations showed that it can also be detected in younger ones especially in Labrador retrievers. Large breeds have lower possibility to syncope, but exercise intolerance, lethargy, inappetance, changes in breathing patterns were the characteristic findings in Labradors. Aregurgitant murmur with a low pitched protodiastollic gallop sound were frequent and important and which is very evidence of severe ventricular dysfunction (Kathryn, 2005) Since the dog is been treated as family member and clients are having very close observation over all above said clinical symptoms, mere change in normal behaviour is alarming the client and that's how the dogs were diagnosed with DCM at an early stages. On anamnesis, it was known that the dogs were maintained on exclusively home diet without much suppliments. On radiographic examination biventricular enlargement, globoid appearance elevated trachea and VHS levels ranged between 11.3-13.5. Electrocardiography showed elevated R wave, deep Q wave with bradycardia and VPCs. However abnormalities of cardiac conduction have been diagnosed in 38% of dogs and changes in wave morphology have been recorded in 62% of dogs. Radiographic changes affecting the cardiac silhouette include left atrial enlargement alone, left aatrial and left ventricle enlargement, right sided enlargement or generalized cardiomegaly (Kathyrn, 2005).

Echocardiography examination revealed reduced ejection fraction, fractional shortening with increased LVIDd and LVIDs. Echocardioghraphic evaluation of left ventricle systolic performance revealed increased end systolic end diastolic dimensions, dilatation of left atrium, decreased fractional shortening and ejection fraction in dogs with DCM. Significant ($P<0.01$) increase was observed I cardiac dimensions in both the long and short axes and in end diastolic and in end systolic volume. This was associated with left ventricle assuming a more spherical shape. Both isovolemic and ejection phase indices were depressed by 50%. The end systolic elastance was also depressed significantly in dilated cardiomyopathy dogs (Shannon *et al.,* 1991). A male predisposition in the greatdane suggest an X-linked mode of inheritance (Meurs *et al.,* 2001). Dogs exhibiting the clinical signs of DCM do not always respond to conventional medical therapy of congestive heart failure.

Angiotensin converting enzyme inhibitors are of more valuable in treating DCM resulting I sustained improvement in clinical signs for several weeks. Enalapril/ ACE-I improves echocardiographic and neurohormonal variables in dogs with DCM (Oyama *et al.,* 2007).

Nikiaidis *et al.,* 2002 observed that ACE inhibitor enalapril improves transmural myocardial perfusion at rest and after chronotropic stress and restores sub endocardial coronary flow and vasodilator reserve in DCM.

In the present study, it may be concluded that the though the occurrence of dilated cardiomyopathy is more in older dogs, but in recent days DCM occurrence in young aged 1-3 year old become more and alarming the dietary and inheritance patterns.

Author Contributions

G. Saritha: Investigation, formal analysis, writing—original draft. K. Vignatha: Validation, methodology, writing—reviewing. Bhavishya:—Formal analysis, writing—review and editing. Preethiram: Investigation, writing—reviewing.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of Interest The authors declare no competing interests.

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