

Diagnostic Use of Vertebral Heart Score for Dilated Cardiomyopathy in Dogs

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ABSTRACT

The present study was aimed to use vertebral heart score for confirmatory diagnosis of suspected dilated cardiomyopathy (DCM) in dogs (n=18) among 6366 dogs presented at College Clinic, Navsari, Gujarat, over a period of two years. The most common symptoms in dogs suspected of cardiac diseases (n = 56) were exercise intolerance, dyspnoea, weakness, coughing, inappetence, weight loss, abdominal enlargement, vomiting, and syncope. Suspected cases of cardiac abnormalities were screened for confirmatory diagnosis of dilated cardiomyopathy, which revealed 18 patients with DCM. The vertebral heart size was measured as the sum of the long-axis and short-axis at its greatest diameter and then compared with the vertebra bones starting at T4. The vertebral heart score in dilated cardiomyopathy-affected dogs was found significantly ($p < 0.01$) higher than healthy dogs ($12.27 \pm 0.25v$ Vs. $9.17 \pm 0.12v$). Vertebral heart score measurement on thoracic radiography in the absence of advanced diagnostic types of equipment can be helpful to rule out cardiac enlargement in dogs and initiation of treatment in field conditions.

Keywords: Diagnostic tool, Dilated cardiomyopathy, Dogs, Vertebral heart score.

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INTRODUCTION

Cardiomyopathy is defined as a disease of the myocardium associated with cardiac dysfunction (Richardson *et al.*, 1996).. Dilated cardiomyopathy (DCM) is a major cause of morbidity and mortality in various dog breeds. The vertebral heart score (VHS) measurement has been described as a more objective method for assessing cardiomegaly in dogs (Calvert and Wall, 2001). Measurement of heart size is important for evaluating heart disease in veterinary medicine. The measurement is based on cardiac height and width and is normalized to overall body size by comparison to vertebral body length. (Buchanan and Bucheler, 1995). The VHS is the sum of the long and short axis, each measured caudally from the cranial edge of the 4th thoracic vertebra. Furthermore, this method is employed mainly for radiographic evaluation of the heart in dogs with different cardiovascular disorders. No significant differences were reported between wide and deep-chested dogs, males and females, and right or left lateral recumbency, even though right lateral recumbency is in routine practice. It provides the most accurate information on the cardiac size (Buchanan, 2000). The present study aimed to study cardiac measurements using the VHS and use to diagnose dilated cardiomyopathy in dogs.

MATERIALS AND METHODS

The present study was carried out during a period from April 2018 to March 2020 in the Department of Veterinary Medicine in collaboration with Department(s) of Veterinary Clinical Complex (VCC) and Veterinary Surgery, College

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of Veterinary Science and Animal Husbandry, Navsari Agricultural University, Navsari, Gujarat, India. A total of 6366 cases of dogs presented at Clinics were included for suspected cardiac disease. The patients expressing symptoms of exercise intolerance, dyspnoea, weakness, coughing, inappetence, weight loss, abdominal enlargement, vomiting, and syncope were suspected for cardiac diseases (n = 56). Clinical symptoms of suspected cases and required information were collected from individual cases and

recorded in a proforma. Right lateral thoracic radiographs were taken for the determination of cardiac size. The long axis (L) and short-axis (W) of the heart were measured with the help of calipers, and these dimensions were then transposed onto the vertebral column and recorded as the number of vertebrae beginning with the cranial edge of T4 (fourth thoracic vertebra). The values were then added to obtain the Vertebral Heart Size (VHS) according to Buchanan and Buchler (1995) (Plate 1). All 18 dogs were confirmed to have DCM based on VHS in a thoracic radiograph. Further, nine apparently healthy dogs brought for routine check-ups and vaccinations at the clinic were included as a control. The mean \pm SD for vertebral heart score of healthy and DCM affected dogs was obtained and compared using student's 't-test on IBM SPSS statistical software version 20.0.

RESULTS AND DISCUSSION

Over a study period, total 6366 cases of dogs were registered and examined at College Clinic. Based on the presence of a combination of clinical symptoms of cardiac diseases, only 56 cases (0.88%) were suspected of cardiac illnesses. Among these 18 cases (32.4%), dilated cardiomyopathy was diagnosed based on VHS in the thoracic radiograph. DCM is recognized as the most frequently observed heart disease in dogs throughout the world, as was also stated in Indian reports (Thirunavukkarasu, 2014; Bodh *et al.*, 2016; Vishnurahav *et al.*, 2018).

Thoracic radiographs of healthy dogs did not show any enlargement / abnormal regional dilatation or deviation of the cardiac silhouette. No dilatation or stenosis of the trachea

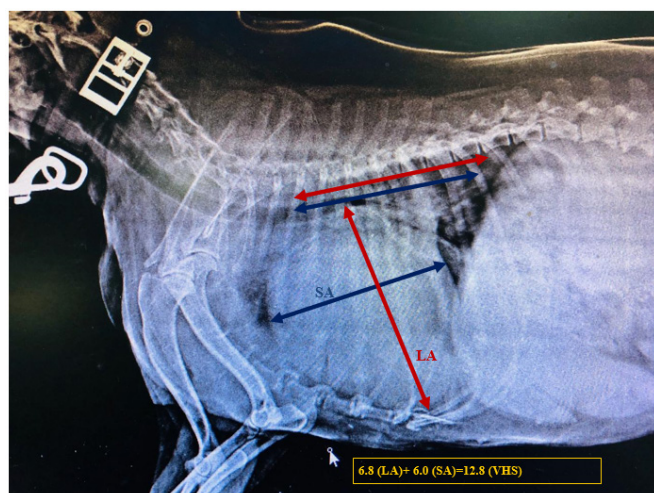


Plate-1: Vertebral heart score measurement on a lateral thoracic radiograph

Table 1: VHS measurement in healthy and DCM affected dogs

Parameters	Healthy dogs (n = 11)	DCM affected dogs (n = 18)
Vertebral Heart Score	8.97 \pm 0.11 V	12.27 \pm 0.25 V **

**Significant at p < 0.01.

was noticed, and the congestion at the carina was absent to minimal. The VHS of healthy dogs was $8.97 \pm 0.11v$ (Table 1). The mean VHS of healthy dogs recorded in the present study was in accordance with findings of Buchanan (2000), who noticed $9.7 \pm 0.5v$ VHS from 100 normal dogs. A similar range of mean VHS of healthy dogs was also reported by Fox (2003), Bodh *et al.* (2016), Bhargavi *et al.* (2019), and Bappah *et al.* (2021).

Further, according to Buchanan and Buchler (1995), the differences between dogs with a wide or deep thorax, males and females, and right or left lateral recumbency are not significant in VHS measurement. The VHS in DCM-affected dogs in the present study was $12.27 \pm 0.25v$ (Table 1), and it was significantly higher ($p < 0.01$) than healthy dogs, suggestive of the enlargement of cardiac silhouette due to the presence of structural heart disease. It might be due to the dilatation of cardiac chambers in DCM. This finding was in accordance with the previous reports from India (Rajkumar, 2013; Bodh *et al.*, 2016; Venkatesakumar *et al.*, 2018; Bhargavi *et al.*, 2019). A VHS over 10.7v on lateral radiograph was suggested as a moderately accurate sign of cardiac disease (Lamb *et al.*, 2000). Vertebral heart score demonstrated as an ideal cardiac dimension with no gender variation that can be useful in diagnosing and monitoring cardiac diseases in dogs (Buchanan and Buchler, 1995). Further, Vertebral heart score was reported to have a good relationship with echocardiographic and electrocardiographic parameters (Nakayama *et al.*, 2001). Therefore, it has been considered the best cardiac dimension for diagnosing cardiac anomalies in dogs with little inter-observer differences. It also allows inexperienced diagnosticians to recognize cardiomegaly (Buchanan, 2000).

From the study, it can be concluded that in the absence of advanced diagnostic facilities in field conditions, the clinician can use vertebral heart scale measurement as initial diagnostic tool to rule out the cardiac enlargement, *i.e.*, dilated cardiomyopathy in dogs.

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