VERTEBRAL HEART SCALE SCORE OF MONGREL DOGS

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Nineteen mature healthy mongrel dogs with mean age of 2.6 years underwent lateral thoracic radiography for evaluation of Vertebral Heart Score (VHS). The long axis of the heart was measured from the ventral border of the left main stem bronchus to the cardiac apex and short axis was measured at the widest point of the cardiac image on a line perpendicular to the long axis at the level of the caudal vena cava. Long and short axis measurements were compared to the vertebrae starting at the cranial edge of T4 to caudally. Result expressed in units of vertebral lengths was obtained for each axis and the two numbers were then added together to give the value of the VHS. The vertebral heart score in clinically healthy native dogs was 10.13 ± 0.18 vertebrae with a range of 8.9 to 11.5 vertebrae. The mean ± SE of short axes were 4.57 ± 0.10 vertebrae and of long axes were 5.55 ± 0.09 vertebrae. Significant difference was not observed in male and female dogs in relation to VHS, longitudinal axis and short axis.

Keywords: Cardiomegaly, Mongrel dogs, Thoracic radiography, Vertebral Heart Score.

Introduction

Cardiomegaly as a consistent sign of heart disease can be seen in cases of hypertrophic or dilated cardiomyopathy (Litster and Buchanan, 2000). Thoracic radiography is an integral part of the diagnosis and management of cardiac disease (Root and Bahr, 2002). Studies using planimetry and various cardiothoracic ratios have been reported, a guideline of 2.5 to 3.5 intercostal spaces for dogs was introduced but limitations of this method are variations of the heart size and shape, conformation of the thorax, phase of respiration, superimposition of ribs, and imprecise measurement points (Lamb and Boswood, 2002). Method for measuring the canine cardiac silhouette that involves measuring its long and short axes in a lateral radiograph and comparing the sum of these measurements to the mid thoracic vertebral bodies, to produce a unitless index called the vertebral heart (VHS) score is described by Buchanan and Bucheler (1995) as there is good relations were known to exist between body length and heart weight. As there are various factors that influence the VHS measurement, interbreed differences in regards to normal heart size and shape is important to consider whenever the heart is evaluated (Hansson, 2005). Lamb et al., (2001) have documented the VHS score for various breeds like Doberman (10 ±0.6), German shepherd (9.7 ± 0.7), Cavalier King Charles spaniel (10.6 ± 0.5), Labrador retriever (10.8 ± 0.6) and Boxer (11.6 ± 0.8). Lamb et al. (2001) suggested the use of breed-specific VHS values to have a high specificity for normal heart size. VHS score can be used to assess progressive cardiomegaly (Buchanan and Bucheler, 1995), pacing induce experimental heart failure (Nakayama et al., 2001), hypoadrenocorticism (Melian et al., 1999). Large populations of mongrel dogs are still used as companion animals in India, therefore, the present study was planned to establish the reference range of VHS in mongrel dog.

Materials and methods

Ten males and nine females healthy mongrel dogs (19), presented for diseases other than cardiovascular system with mean age 2.6 years were selected for the study after clinical (physical examination and auscultation) and laboratory evaluation (haematobiochemical and urinalysis). Left lateral
Thoracic radiographs were taken during inspiration as suggested by Gulanber et al., (2005). The radiographs were taken in least stress condition without use of any anesthetic agents. The long axis of the heart, reflecting the combined size of the left atrium and left ventricle was measured from the ventral border of the left main stem bronchus to the cardiac apex. The short axis was measured at the widest point of the cardiac image on a line perpendicular to the long axis at the level of the caudal vena cava (Buchanan and Bucheler, 1995).

Measurements were recorded in centimeters for statistical analyses. Long and short axis measurements were compared to the vertebrae starting at the cranial edge of T4 to caudally and result expressed in units of vertebral lengths was obtained for each axis (fig-1). The measurements of the long and short axes were recorded in terms of the numbers of vertebrae covered and the two numbers were then added together to give the value of the VHS and data are expressed as mean ± SE.

**Fig-1** The short axis measurement of the cardiac silhouette (A) and the long axis measurement (B) gives VHS on a lateral thoracic radiograph.

**Results**

The vertebral heart score in clinically healthy native dogs was 10.13 ± 0.18 vertebrae. Distribution of VHS range was 8.9 to 11.5 vertebrae. The Mean ± SE of short axes were 4.57 ± 0.10 vertebrae and of long axes were 5.55 ± 0.09 vertebrae. The longitudinal axis in bitches was 5.61±0.13, while in dogs was 5.61±0.13 vertebrae. The short axis in bitches was 4.63 ± 0.12; while in dogs was 4.51 ± 0.15 vertebrae. VHS in females was 10.14 ± 0.24 and in males was 10.12 ± 0.26 (table-1). Data were analyzed through SAS enterprise guide version 4.4 and no significant difference between males and females was found in relation to long axis, short axis and Vertebral heart Score.

**Table-1 (Mean ± SE) Vertebral heart score (VHS) and various axis in mongrel dogs**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Long axis</th>
<th>Short axis</th>
<th>VHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male (N=10)</td>
<td>5.61±0.13</td>
<td>4.51±0.15</td>
<td>10.12±0.26 NS</td>
</tr>
<tr>
<td>Female(N=9)</td>
<td>5.51±0.13</td>
<td>4.63±0.12</td>
<td>10.14±0.24 NS</td>
</tr>
<tr>
<td>Total (N=19)</td>
<td>5.55±0.09</td>
<td>4.57±0.10</td>
<td>10.13±0.18</td>
</tr>
</tbody>
</table>
Discussion
The recognition of interbreed variations of cardiac dimensions has led to the development of breed-specific ranges for echocardiography in dogs (Nakayama et al., 2001), in the same direction Lamb et al., (2001) published breed-specific VHS ranges for some popular breeds of dogs like Doberman Labrador retriever and Boxer etc. Mongrel dogs are not a registered breed in our country, and there is no reference range for such parameters. In present study the range of VHS for native dogs was 10.09 ± 0.76 vertebrae, which is found closer to Labrador retriever having VHS score of 10.8 ± 0.6 vertebrae (Lamb et al., 2001), but was slightly above than VHS in initial study of Buchanan and Bucheler, (1995), who reported the mean VHS of 9.7 ± 0.5 vertebrae. Distribution of VHS range was 8.9 to 11.5 vertebrae; this finding was in agreement with Buchanan and Bucheler, (1995), who reported a clinical range of 8.5 to 10.5 vertebrae. VHS range of present study was indicative of great variation in the VHS score. More researches in this direction are required as cardiac measurements are likely to be useful only when the normal range is relatively narrow (Lamb et al., 2000). In the present study sex dependant VHS score was non-significant and may be used for diagnosis of cardiomegaly in dogs. Similar observations were reported in dogs by Bavegems et al., (2005). However, Sleeper and Buchanan (2001) recommended that sex should be taken into account when evaluating the possibility of cardiomegaly on the basis of the VHS. VHS values for heart size can be affected by several factors like individual variations in the actual heart size, vertebral length between breeds of dog need to be considered, as well as the presence of narrowed disc spaces. Hansson et al., (2005) have suggested the possibility of inter individual variation in measurement. Gulanber et al., (2005) suggested one positional fault as a cause of wrong interpretation of VHS, they suggested that in lateral radiography if X-ray beams and thorax are not exactly vertical on each other, VHS will be changed and this fact should be taken into consideration while interpreting radiograph. In the present study the radiographs were taken and evaluated in the standard position to rectify the positional variation in VHS. Besides shape and size of heart, thoracic radiography can be used to get the status regarding pulmonary circulation and amount of pulmonary edema (Richard et al., 2007).

On the basis of above study it was concluded that cardiomegaly can be easily determined on the basis on left lateral thoracic radiography using VHS application. Although the VHS range have been reported by various researcher for some popular breeds of dog for clinical purpose, still most of the breeds are not standardized in this relation. Cardiac measurements are likely to be useful only when the normal range is relatively narrow. Thoracic radiography is proved integral part of the diagnosis and therapeutic evaluation of cardiac disease. Studies using planimetry and various cardiothoracic ratios have been reported but limitations of this method must be recognized.

References

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