RADIOGRAPHIC EVALUATION OF HEART USING VHS IN DOGS WITH PARVO VIRAL GASTROENTERITIS

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A radiograph of the thorax cavity is useful as another diagnostic modality to detect heart disease size and has the potential to provide check equivalent to other cardiac diagnostic modalities. The radiographic examination included left and right lateral thoracic radiographs from non-sedated animals. After the radiography, the long axis and short axis of the heart was measured from lateral radiographs of the thorax. Vertebral heart score (V.H.S) measurements were recorded to assess the cardiac silhouette and size in dogs with gastroenteritis. In the present study, thoracic radiographs of the left and right lateral recumbence were taken to calculate the vertebral heart score (VHS). A total of six pups affected by gastroenteritis were used for the study and six healthy pups were kept as the control group.VHS was 9.5 and 11.2of the hearts to the vertebrae in healthy and affected pups, respectively. Significant differences were observed between the VHS of the diseased and healthy dogs. Results of the study revealed that thoracic radiography is a useful diagnostic tool for assessing cardiac size and systemic reading aids.

Keywords: Left lateral radiographs, Right lateral radiographs, Radiograph, Vertebral Heart Score (VHS).

Viral disease is characterized by severe vomiting and diarrhoea (Rana and Sharma, 2023).The necrotizing myocarditis is also associated with this infection and it further leads to dilated cardiomyopathy (DCM) in young pups up to 6 months (Verdonschot *et al*., 2016). To assess the cardiac enlargement, thorax radiography is useful (Parmar *et al*., 2022). Radiography of the thorax is a rapid, cost-effective and widely accessible method for evaluating cardiac size in dogs (Puccinelli *et al*., 2021).The measurement of the dimensions of the cardiac silhouette in relation to the thoracic vertebral bodies is otherwise referred to as the Vertebral Heart Score (VHS) (Burti *et al.,* 2020). The VHS provides a good correlation between the growth of visceral organs, including the heart and vertebral body length (Haruna *et al*., 2021). The vertebral heart size is 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 (Bappah *et al.,* 2021).

Materials and methods

The present study was carried out in the Veterinary Clinical Complex, CVAS, Navania, Vallabhnagar, Udaipur, Rajasthan. Out of 52 dogs, 14 pups were suffering from gastroenteritis.The clinical manifestations seen in these pups were anorexia, vomiting, and foul-smelling diarrhoea with or without blood. Among them six pups were diagnosed positive for parvovirus infection with the help of Bionote Rapid Anigen Ag test kit (Fig.1). These pups were also suspected of having myocarditis based on the existence of a combination of clinical symptoms viz. severe dyspnoea, depression and weakness. Cardiomegaly may also arise from myocarditis. Therefore, thoracic radiography was used to get a vertebral heart score in order to confirm cardiomegaly.

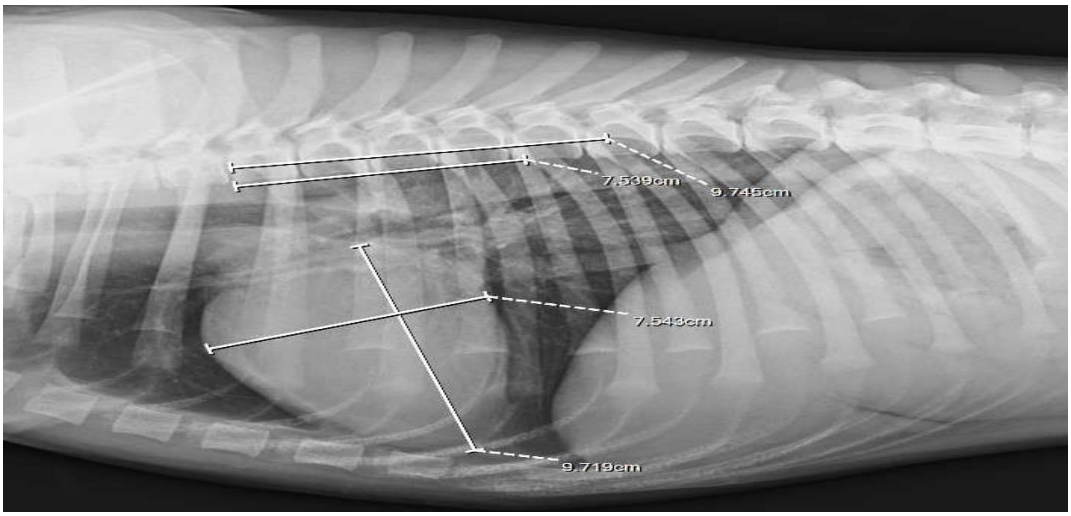

Fig.1. DOG IS SHOWING VHS 9.5 IN RIGHT LATERAL VIEW (NORMAL RANGE)

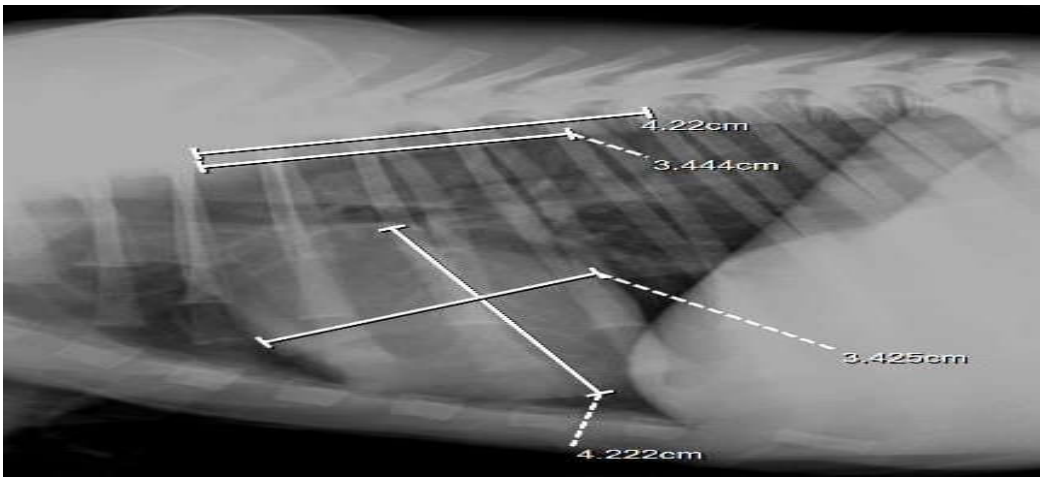

Fig.2. DOG IS SHOWING VHS 9.8 IN LEFT LATERAL VIEW (NORMAL RANGE)

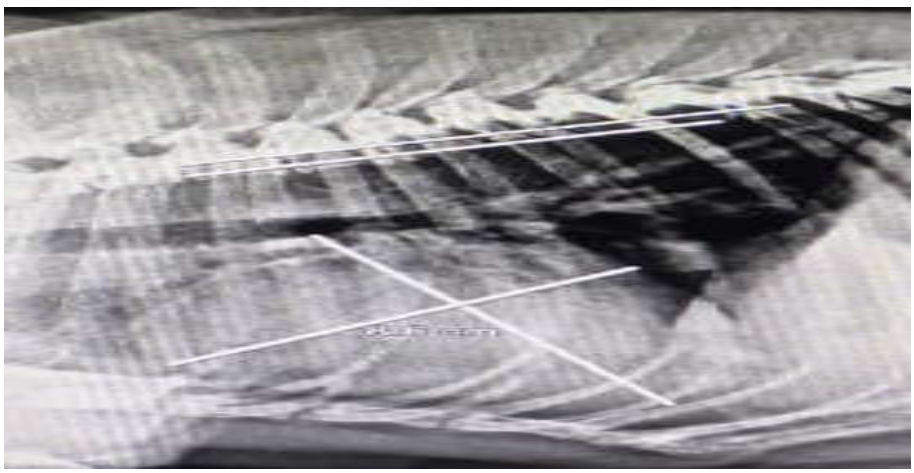

Fig.3. DOG IS SHOWING VHS 12.3 IN RIGHT LATERAL VIEW (ABNORMAL RANGE)

Six apparently healthy dogs with normal vital parameters were selected as the control group. The BPL 500 X-ray machine was used to determine heart size by right and left radiography. 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 Score (VHS). The sum of the measurements of both axes determined the VHS and the data were expressed as mean ± SE. The obtained data was evaluated by ANOVA. Differences were considered significant at $P<0.05$ and $P<0.01$.

Results and Discussion

Thoracic radiographs of the left and right lateral recumbence were taken from both healthy dogs and affected pups to calculate the vertebral heart score (VHS). On thoracic radiographs, healthy dogs showed no abnormal regional dilatation, enlargement, or distortion of the cardiac silhouette. But, a variation from the typical cardiac silhouette was seen on the radiological examination of the affected pups. The healthy dogs' vertebral heart scores varied from 8.5 to 10.5. If the range of the VHS is greater than 10.5, cardiomegaly could be a reason as also reported by Haruna *et al*., 2021 and Parmar *et al*., 2022.

Table 1: COMPARISON BETWEEN VHS IN HEALTHY AND CPV INFECTED PUPS

VHS view	Right view of VHS (Mean ± S.E)	Left view of VHS Mean ± S.E
Healthy dogs	**10.2 ± 0.24**	**9.5 ± 0.26**
CPV affected dogs	**12.5 ± 0.17****	**11.3 ± 0.25****

** Significant at the level of P <0.01

In the present study, mean ± S.E value of the VHS of left lateral radiographs was found to be 9.5 ± 0.26 (Fig.2) and 11.3 ± 0.25 (Table 1) and right lateral radiographs was found to be 10.2 ± 0.24 (Fig.1) and 12.5 ± 0.17 (Fig.3) in healthy and affected pups (Table 1), respectively. The mean heart rate of the affected dogs in this study was considerably higher ($p<0.01$) than that of the healthy dogs. This suggests that structural changes in heart tissue due to CPV disease (myocarditis) is causing the heart to increase in shape. These finding were in accordance to the previous findings of Bodh *et al*., 2016; Venkatesakumar *et al*., 2018; Bhargavi *et al*., 2019 and Parmar *et al.,* 2022. Many researchers have recommended the comparison between the radiographs of affected to the radiograph of a completely healthy dog of the exact same breed and size. However, the vertebral heart score has been shown to be a gender-neutral optimal cardiac dimension that can be helpful in the diagnosis and follow-up of cardiac conditions in dogs as also mentioned by Parmar *et al.,* 2022. Thus, VHScan be regarded as the ideal cardiac dimension for identifying heart abnormalities in dogs.

Conclusions

The current study provides that thoracic radiography andvertebral heart scale measurement (VHS) is a useful initial diagnostictool for assessing cardiac enlargement in parvovirus-affected pups in the lack of advanced diagnostic equipment in the field.

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