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Thoracic radiographic assessment of acquired heart diseases in canines

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Abstract

Acquired heart diseases (AHD) are common and often fatal when it leads to CHF in dogs and it occurs most often secondary to degenerative Mitral Valve Disease (MVD), Dilated Cardio Myopathy (DCM), Pericardial diseases and Hypertrophic Cardio Myopathy (HCM). Animals with acquired heart diseases were selected from the animals that were brought to MVC teaching hospital and they were grouped as Dilated Cardiomyopathy (DCM), Mitral Valve Disease (MVD), Pericardial diseases, Hypertrophic Cardiomyopathy (HCM). 106 animals with acquired heart diseases were selected and they were grouped as Dilated Cardiomyopathy (DCM), Mitral Valve Disease (MVD), Pericardial diseases, Hypertrophic Cardiomyopathy (HCM). Thoracic radiography was the most commonly applied method for the diagnosis of AHD.

Keywords: canine, congestive heart failure, DCM, MVD, radiography

1. Introduction

Congestive heart failure (CHF) is the inability of the heart to provide adequate circulation to meet the body's needs. It is the end result of a weakened heart muscle. The health of the liver, kidneys, lungs, and other organs is impaired by the CHF, resulting in a problem involving multiple organs. Acquired heart diseases (AHD) are common and often fatal when it leads to CHF in dogs characterized by cardiac dysfunction, neuro-hormonal activation, sodium and water retention and increase in left ventricular (LV) filling pressures (LVFP). It occurs most often secondary to degenerative mitral valve disease (MVD), dilated cardiomyopathy (DCM) and pericardial diseases. Diagnosing heart disease and/or heart failure in the dog requires a combination of several different testing methods. Thoracic radiography was the most commonly applied method for the diagnosis of AHD. Qualitative and quantitative radiographic parameters were compared to evaluate the usefulness of thoracic radiography for the identification of acquired heart diseases in the canines.

2. Materials and Methods

This study was carried out in the sick dogs brought to Small Animal Clinic, Outpatient Medical Unit of Madras Veterinary College Teaching Hospital, with clinical signs suggestive of cardiac failure and then confirmed by echocardiography. The study consisted of five groups which included apparently healthy dogs and clinical cases of acquired heart diseases with heart failure.

Thoracic radiographs are used as a screening tool for dogs with a variety of disorders. High-quality, correctly positioned radiographs are required in order to provide as accurate an assessment as possible. In addition, a 3-view thorax (right lateral, left lateral, and dorso-ventral (DV) or ventro-dorsal (VD) view) is considered the standard of care.

2.1 Vertebral Heart Scale

A vertebral heart score (VHS) is a measurement used to determine if a patient's heart is enlarged. The VHS can provide valuable insight to complete your clinical picture. It's a simple, non-invasive way to get more information and to monitor for changes over time. For dogs, a normal vertebral heart score is less than 10.7 (with an average range of 8.5 to 10.5). Anything larger than that is considered abnormal.

All the animals under the study were subjected to radiographic examination as per standard techniques suggested by Buchanan (2000) [1, 6]. Based on the Vertebral Heart Score (VHS), the cardiac size of the selected clinical cases was assessed and cardiomegaly was evaluated. Cardiac and Pulmonary structures were assessed and interpreted for cardiovascular disorders

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following standard protocols of Buchanan and Bucheler (1995) [2] and Ettinger and Feldman (2010) [3].

3. Results

The Radiographic findings are presented in Table 1. The mean ± SE values of Vertebral Heart Score (VHS) for control group was 9.99±0.20. The VHS was a highly significantly increased in Group II (10.81±0.08) and Group IV (11.13±0.15), when compared to that of control group. Radiographic (Figure 1, 2, 3) evidence of cardiomegaly was

observed in 93.10 per cent of Group II, 15.38 per cent of Group III and 100.00 per cent of Group III. Radiographic evidence of pulmonary oedema was evident in 72.76 per cent of Group II, 71.79 per cent of Group III, 16.67 per cent of Group IV and 33.33 per cent of Group V. Pleural effusion was evident in 20.69 per cent of Group II, 15.38 per cent of Group III and 16.67 per cent of Group IV. Radiographic evidence of left atrial enlargement was evident in 5.17 per cent of Group II and 82.05 per cent of Group III.

Table 1: Radiographic Findings in Dogs with Acquired Heart Disease

Radiographic findings	Group - I Control (n=20)	Group - II Dilated Cardiomyopathy (n=58)	Group - III Mitral Valve Disease (n=39)	Group - IV Pericardial Effusion (n=6)	Group - V Hypertrophic Cardiomyopathy (n=3)	F Value
Vertebral Heart Score (VHS)	9.99±0.20 ^a	10.81±0.08 ^b	9.71±0.11 ^a	11.13±0.15 ^b	9.70±0.38 ^a	21.286**
Cardiomegaly (%)	-	93.10	15.38	100.00	-	-
Pulmonary Oedema (%)	-	72.76	71.79	16.67	33.33	-
Pleural effusion (%)	-	20.69	15.38	16.67	-	-
Left Atrial enlargement (%)	-	5.17	82.05	-	-	-

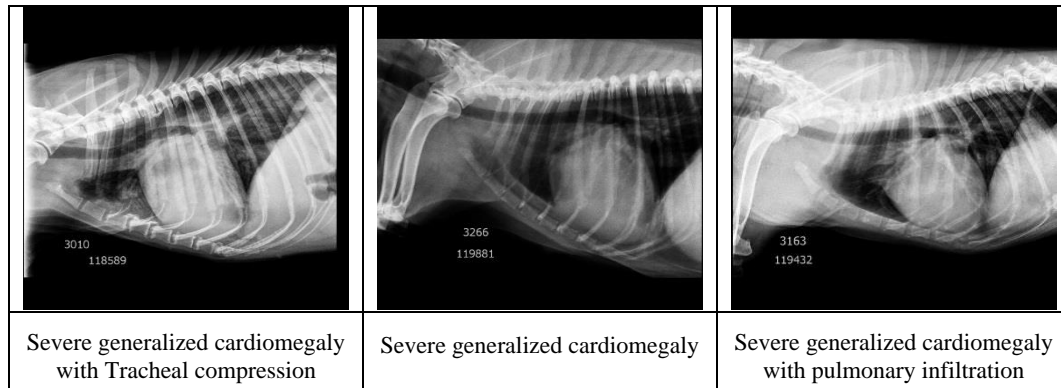


Fig 1: Dilated Cardio Myopathy (DCM)

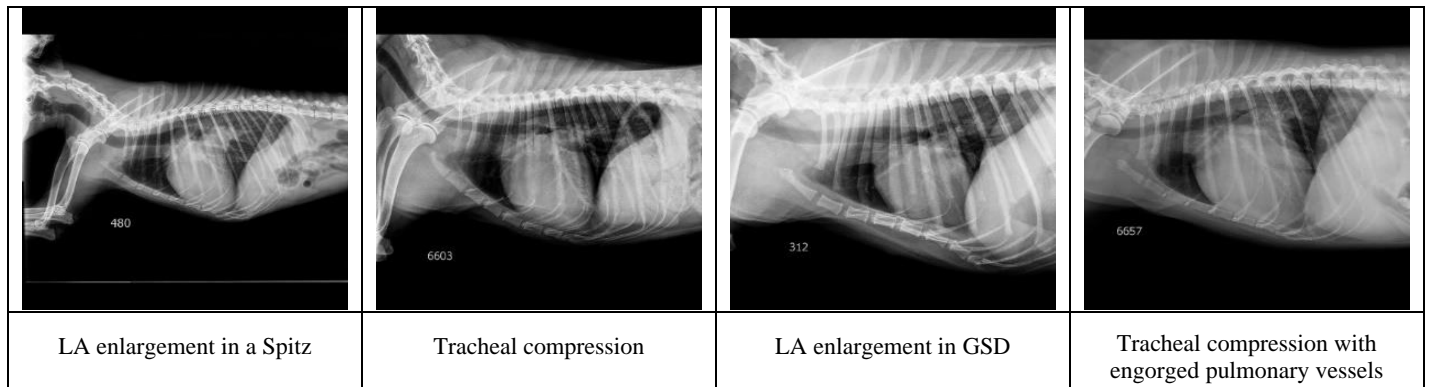


Fig 2: Mitral Valve Disease (MVD)

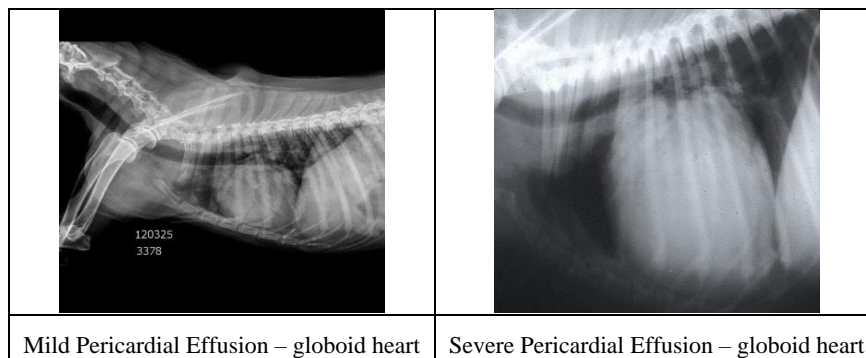


Fig 3: Pericardial Effusion (PE)

4. Discussion

Radiographic findings were considered important as they provided information regarding the presence and severity of any underlying cardiac disease or related co-morbidities (Buchanan and Bucheler, 1995) [2]. Dogs with AHDs were found to have radiographic evidence of heart enlargement and particularly left atrial enlargement in MVD, pulmonary signs of congestive heart failure, which included increased pulmonary venous prominence, vascular and interstitial changes. In the current study, there were radiographic evidence of cardiomegaly (93.10 per cent) and pulmonary oedema (82.76 per cent) in dogs with DCM. These findings are in agreement with (Tidholm and Jonsson, 1996; Meurs *et al.*, 2001 and Martin *et al.*, 2009) [9, 7]. Radiographic evidence of left atrial enlargement were observed in majority of the dogs with MVD in the current study which concurs with various authors (Thomas, 1984; and Menaut *et al.*, 2005) [10, 8].

The dogs with DCM had a highly significant elevated Vertebral Heart Score and radiographic signs that confirmed the presence of structural heart disease. This might be due to dilatation of all chambers in DCM. Similarly, in pericardial effusion a highly significant increase in VHS were observed. This finding were mainly because of the dilation of pericardium with fluid. In radiographic findings of the present study the heart appeared like foot-ball with rounded margins. These findings are similar to the observations of Buchanan and Bucheler, (1995) [2]; Lister and Buchanan, (2000) [6]; and Lamb *et al.*, (2000) [5]. In hypertrophic cardiomyopathy there were no radiographic changes. This concurs with Fox (2003) [4].

5. Conclusions

Radiographic signs of AHDs included cardiomegaly, pulmonary oedema and left atrial enlargement. Dogs with DCM and pericardial effusion had significantly elevated VHS and confirmed the presence of acquired heart disease.

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