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Ultrasonic doppler systolic blood pressure analysis in canine acquired heart diseases

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Abstract

Acquired heart diseases (AHD) are common and often fatal when it leads to Congestive Heart Failure 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 Madras Veterinary College 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). Doppler Method (DOP) is a non-invasive ultrasonic method of measuring the systolic blood pressure (SBP) in canines. It was the most commonly applied method for SBP measurement and this measurement has no significant role in the diagnosis of AHD.

Keywords: canine, congestive heart failure, DCM, MVD, HCM, doppler blood pressure

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.

The Instrument used for the present study was Vmed Vet-Dop. It consisted of Doppler detector, sphygmomanometer, ultra sound gel and different sized cuffs. Animal was placed on right lateral recumbency, either forelimb or hind limb was used, limb circumference at the site of cuff placement was measured using an inch tape. The cuff whose width was about 40 per cent of the limb circumference was used for blood pressure measurement. The cuff was consistently placed in the left forearm region at the level of heart and about 10 cm from the heart (i.e. over the mid – ante brachium). As the superficial palmar arterial arch is used for blood pressure measurement, the hair over the area distal to palmar meta carpal pad was clipped and the appropriate sized cuff was positioned over the mid- ante brachium. Ultrasound gel was applied to get good contact between the skin and the transducer. The cuff is attached to a pressure manometer and inflated and deflated manually. The first sound heard as the cuff gradually deflates is recorded as the systolic pressure. The diastolic pressure is estimated by a change in the character of the pulsing sound as the cuff deflates.

Five subsequent measurements were taken and the average value was taken for analysis. Systolic blood pressure was measured using Doppler BP apparatus as per standard protocols of Carr (2001) [2].

3. Results

The mean \pm SE values of systolic blood pressure are

presented in Table 1. No significant differences were observed in the mean \pm SE values of systolic blood pressure in different groups of AHDs in dogs, when compared to that of the control group.

Table 1: Doppler Systolic Blood Pressure in Control and Acquired Heart Disease Cases

| Parameters | 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 |
|------------|--------------------------------|---|--|--|--|---------------------|
| BP (mmHg) | 115.56 \pm 3.38 ^a | 120.18 \pm 1.10 ^a | 120.00 \pm 1.41 ^a | 120.00 \pm 3.65 ^a | 120.00 \pm 5.77 ^a | 0.579 ^{NS} |

Same superscript in row do not differ significantly; NS Not significant ($P>0.05$); *Significant ($P<0.05$); **Highly Significant ($P<0.01$)

4. Discussion

No significant difference in the mean systolic blood pressure were observed in AHD dogs compared to normal dogs. This finding is in agreement with Weiser *et al.* (1977) [7] who reported normal systolic blood pressure.

Increased blood pressure increases the peripheral vascular resistance causing increase in the after load. Therefore, increased blood pressure can also be a reason for reduced fractional shortening with normal left ventricular end diastolic dimension in healthy dogs. In this study the DCM group has reduced FS, which were mainly due to increased left ventricular end diastolic dimension, not due to blood pressure as reported by Henik *et al.* (2005) [4]. Therefore, blood pressure measurement is warranted in all the dogs which show reduced fractional shortening to rule out the primary cause.

Increased blood pressure results in secondary HCM in dogs and in this study the blood pressure were normal. Hence the HCM reported in this study were not secondary HCM. This finding concurs with Thomas *et al.*, 1984; and Littmen *et al.*, 1988; Brown and Henik, 1998; De-Morais and Schwartz (2005) [6, 5, 1, 3].

5. Conclusions

Doppler systolic blood pressure measurement is not having any significant role in the diagnosis of canine acquired heart diseases in this study.

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