ELECTROCARDIOGRAPHIC STUDIES IN DOGS WITH CHRONIC MITRAL VALVE DISEASE

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[Received: 06.8.2018; Accepted: 18.2.2019]

{DOI 10.29005/IJCP.2019.11.1.011-014}

Twenty dogs with chronic mitral valve disease were evaluated for the evidence of electrocardiographic variations. The changes recorded were atrial fibrillation, first degree atrioventricular block, second degree atrioventricular block, ventricular premature complex, sinus tachycardia, 'P' mitrale, ST coving, increased amplitude of R wave and low amplitude of QRS complex. Normal sinus rhythm was also recorded.

Keywords: Atrial fibrillation, Chronic mitral valve disease, Electrocardiography, Ventricular premature complex.

Chronic mitral valve disease is the most common acquired heart disease in dogs. It is estimated to account for 75 per cent of all cardiac diseases in dogs (Atkins *et al*., 2009). Electrocardiography (ECG) is widely used as a diagnostic tool for cardiac disorders.Though ECG cannot be considered as diagnostic in most of the cardiac ailments, it is of utmost importance in recording life threatening arrhythmias. The present study describes electrocardiographic changes in dogs with chronic mitral valve disease.

Materials and Methods

Twenty dogs with chronic mitral valve disease were selected for the study. Definitive diagnosis of the disease was done by echocardiographic examination. Electrocardiograms were recorded using BPL-CARDIART-6108T ECG machine at a paper speed of 25mm/second and sensitivity of 1mv = 10 mm (Martin, 2002). Standard bipolar limb lead II was studied. Animal was placed in right lateral recumbency in an isolated environment for 5 to 10 minutes in presence of owner before attempting ECG.

Results and Discussion

Arrhythmias were recorded in fourteen animals. Six animals showed normal sinus rhythm. Types of cardiac arrhythmias recorded were atrial fibrillation, first degree atrioventricular (AV) block, second degree AV block, ventricular premature complex (VPC), sinus tachycardia, 'P' mitrale, increased amplitude of R wave,ST coving and low amplitude QRS complexes.

Atrial fibrillation was recorded in two Labrador retrievers (Fig. 1). Borgarelli *et al*. (2004) and Jung *et al.* (2016) also made similar observations in dogs with mitral valve disease. Structural changes that result associated with mitral valve disease affecting left atrium can increase the atrial wall stress.

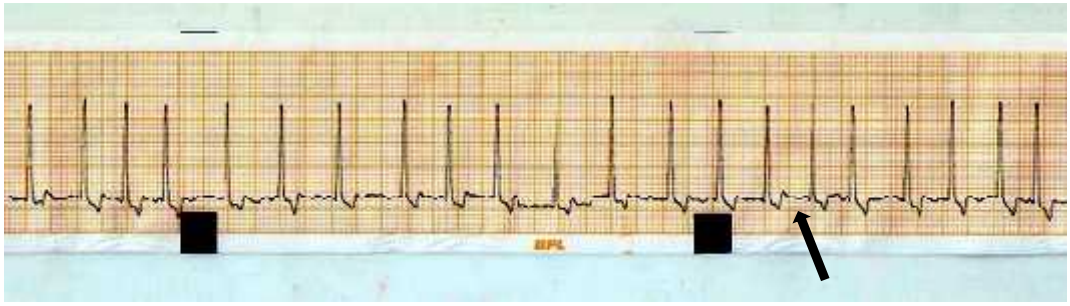

Fig. 1 Atrial fibrillation

Part of M.V.Sc. Thesis

Electrical changes associated with remodeling of the left atrium can also result. These changes can produce atrial fibrillation as also reported by Van den Berg *et al. (*2002) and Hunter *et al.* (2012). Loss of atrial contraction and shortened diastolic filling time in atrial fibrillation reduce cardiac output and increase atrial filling pressure. Quality of life of the patient is compromised in such situations as also mentioned by Burashnikov and Antzelevitch (2010).

Ventricular premature complex (VPC) was recorded in two ECGs (Fig. 2). In VPCs, electrical impulses are initiated within the ventricles instead of sinoatrial node causing ventricles to contract too early. These cases require urgent therapeutic interventions. First degree AV block and second degree AV

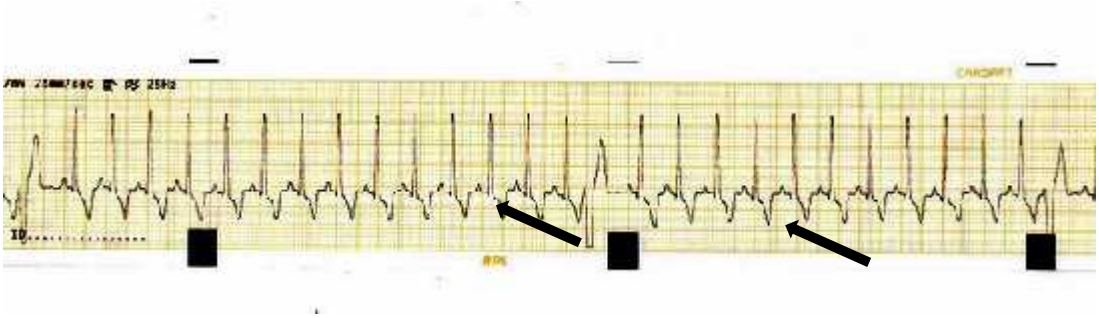

Fig. 2 Ventricular premature complex and ST coving

block were present in two cases each (Fig. 3, 4). Second degree AV block results from degenerative lesions caused by endocardiosis, fibrosis and physical disruption from cardiomayopathy or from inflammatory conditions as also reported by Ettinger and Feldman (2005). Similarly Rasmussen *et al.* (2012) reported, ventricular premature complexes and second degree AV block were the common findings in dogs with myxomatous mitral valve disease and the frequency did not affect the severity of disease.

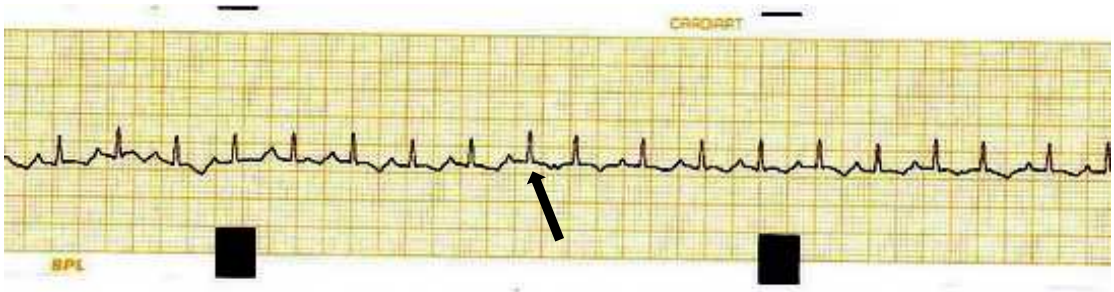

Fig. 3 First degree AV block

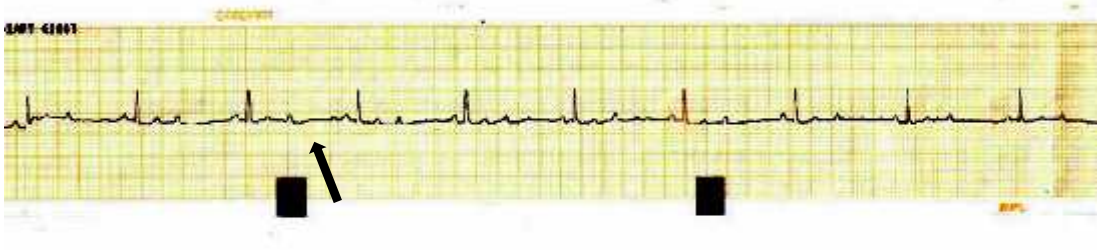

Fig. 4 Second degree AV block

One dog had sinus tachycardia without any other morphological change (Fig. 5). Sinus tachycardia is an early sign of cardiac compensation. Early neuro-hormonal activation causes higher heart rate in the beginning stage of mitral valve disease.

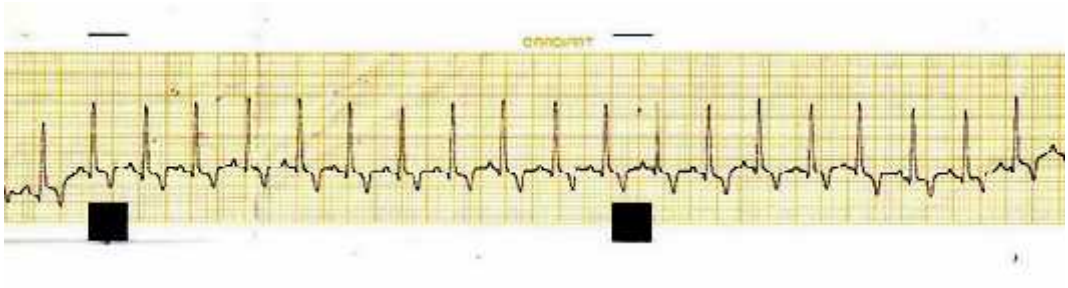

Fig. 5 Sinus tachycardia

P mitrale and increased amplitude of R wave was recorded in one case which was suggestive of left atrial and ventricular enlargement (Fig. 6). These changes occur because of the chronic hemodynamic changes secondary to mitral regurgitation. Left atrium is the first chamber subjected to the increase in internal pressure created by the regurgitant jet while size of the left ventricle deteriorates progressively with the cardiac overload as also mentioned by Baison *et al.* (2016). Echocardiographic examination confirmed the left atrial and ventricular enlargement in this case.

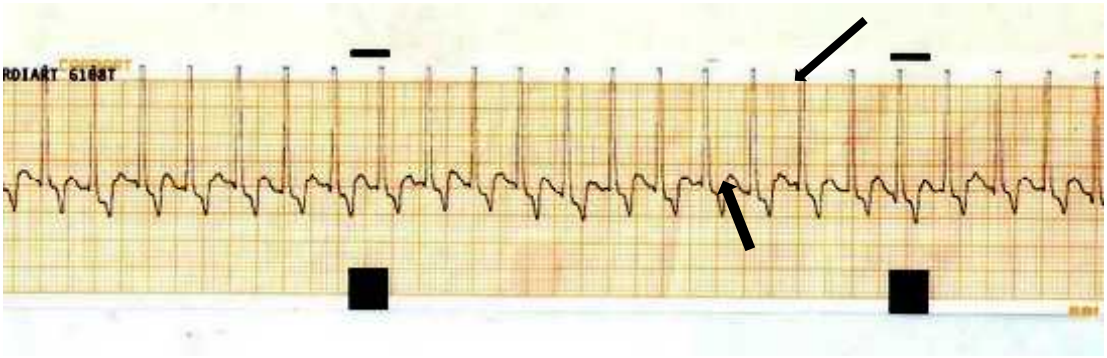

Fig. 6 'P'- mitrale and increased amplitude of R wave

Electrocardiograms of three animals showed ST coving (Fig. 2). Similarly Suh *et al.* (2006) reported, ECG signs indicating myocardial hypoxia can be seen in advanced stages of heart failure. Low amplitude QRS complexes were observed in one non-descript dog with pleural effusion (Fig.7). This was in accordance with the findings of Smith *et al.* (2015). Low amplitude QRS complexs are associated with hindrance in the transmission of cardiac electrical impulses due to the presence of fluid in the thoracic cavity. Normal sinus rhythm was noticed in six cases (Fig. 8). Similarly Baison *et al.* (2016) recorded sinus rhythm in seventeen out of eighteen dogs with chronic mitral valve disease. Variations in ECG in such cases may occur as haemodynamic changes and neuro-hormonal activation results through the course of the disease.

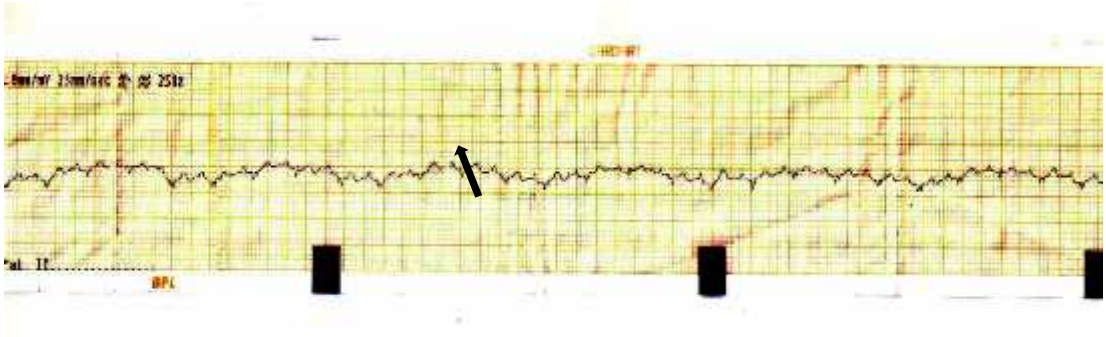

Fig. 7Low amplitude QRS complexes

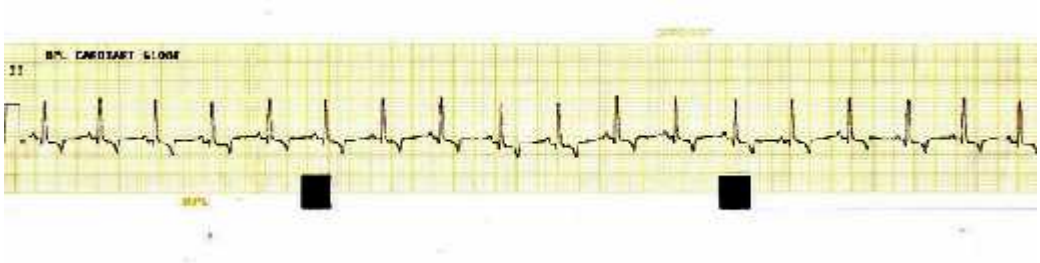

Fig. 8 Normal Sinus rhythm

Different variations in ECG were recorded in the present study. Interpretation of electrocardiograms will be of benefit in cases that require immediate treatment for the variations in addition to the treatment instituted for chronic mitral valve disease.

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