

ELECTROCARDIOGRAM ABNORMALITIES IN RELATION TO IDIOPATHIC CARDIOMYOPATHY IN DOGS

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Idiopathic cardiomyopathy (ICM) is a primary heart muscle disease, usually of unknown etiology. Dilated cardiomyopathy is the most common of all forms of primary myocardial diseases reported in canine patients (Marks, 1993). ICM was recognised as a distinct disease since 1970 (Ettinger and Suter, 1970). Since then only a few reports have described its clinical, clinico-pathological and electrophysiological features. The purpose of the present work is to evaluate the results of ECG findings and to report electrocardiogram abnormalities in relation to ICM.

Materials and Methods

The sick dogs with clinical signs suggestive of cardiopulmonary disorders attended the out patient medical unit of Madras Veterinary College Hospital during the year 1994-96 were screened through general clinical examination. Out of 980 animals screened, sixty cases diagnosed as ICM were taken for evaluation of various parameters. The diagnosis of cardiac disease was made after relating the case history with the results of auscultation, roentgenology, ECG and echocardiographic procedures.

Electrocardiogram was recorded in all the cases as given in Bolton (1975) and Tilly (1992) by using Kody track electrocardiograph. Electrocardiogram was recorded in all the leads viz., I, II, III, a VR, a VL, a VF and V. The ECG parameters in lead II were measured and recorded in electrocardiogram data sheet viz., P amplitude, P duration., QRS duration., R amplitude, P-R interval, S-T segment Pattern., QT interval and T amplitude. Abnormal ECGs were analysed in accordance with those described by Ettinger and Suter 1970. Mean electrical axis were determined as described by Tilley (1992). The values obtained from twenty apparently healthy animals were selected as control group.

Results

All animals with idiopathic cardiomyopathy had electrocardiogram changes. These comprised of chamber enlargement pattern (90%), arrhythmias (70%), conduction disturbance (3.33%), low R amplitude (11.67%) and S-T segment changes (31.67%).

The chamber enlargement pattern were left atrial enlargement (27.78%), left ventricular enlargement (31.48%), left atrio-ventricular enlargement (5.56%) and

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right ventricular enlargement (35.18%). The different types of arrhythmias were sinus tachycardia (50%), atrial fibrillation (14.29%), ventricular tachycardia (7.14%) and ventricular premature beats (28.5%). The type of conduction disturbance observed were first degree heart block (3.33%). Low R amplitude occurred in 11.67 per cent of animals. S-T segment, changes were S-T slurring (47.37%), S-T depression (42.11%) and S-T elevation (10.53%).

The average mean electrical axis (MEA) for the control group was 69 ± 2.28 and the same for ICM group (81.17 ± 4.18) was higher than the control group. But there was no significant difference between these groups. However, right axis deviation (RAD) in 12 dogs and left axis deviation (LAD) in two dogs were found in idiopathic cardiomyopathy group. The axis was shifted between $+110^\circ$ and -110° in the RAD and -20° and -30° in the LAD.

Discussion

The major electrocardiographic findings associated with idiopathic cardiomyopathy, recorded during the present investigation were left atrial enlargement, left ventricular enlargement and right ventricular enlargement. It was interesting to note that left side enlargement (64.82%) was much more than right side enlargement (35.18%). It was again the left ventricle that was affected more frequently than the left atrium. A logical explanation for this could be derived from the pathophysiology of heart failures. (Hamlin, 1968, McIntosh,

1981). McIntosh (1981) opined that elevation of left ventricular filling pressure initiated a self perpetuating cycle of deteriorating myocardial function. In the left side heart failure associated with myocardial failure or mitral regurgitation or both blood dams up in the left atrium and pulmonary vein and capillaries. The degree of dilatation of any chamber was proportional to pressure within and the elasticity and plasticity of the wall. Consequently, a left atrium with intraluminal pressure slightly elevated might dilate markedly if the wall was elastic and plastic, whereas the left atrium might be nearly normal if intraluminal pressure was great but elasticity and plasticity were low. The same holds true for the ventricle. Hamlin (1968) correlated the degree of left atrial enlargement to the disease of the left atrial myocardium because it might alter the elasticity and plasticity of the left atrial myocardium. Similarly the left ventricular enlargement reflected the degree of ventricular myocardial disease.

Hamlin (1968) explained right ventricular enlargement as the third stage of the heart failure and, called it as critical stage. Right ventricular enlargement followed when pressure within the lungs elevated because the left ventricle could not satisfactorily remove blood from lungs. It produced a pressure overload against which the right ventricle must work.

In the present study, certain ECG changes were found existing along with chamber enlargement patterns already discussed. These included arrhythmias

(70%), conduction disturbances (3.33%), decreased R amplitude (11.67%) and S-T segment changes (31.67%). Hill (1981) and Calvert (1986) reported atrial fibrillation in 67 per cent and 19 per cent cases of idiopathic cardiomyopathy. Atkins and Synder (1991) reported sinus tachycardia in dogs with idiopathic cardiomyopathy. Existence of ventricular tachycardia in clinical cases of idiopathic cardiomyopathy was reported by Calvert *et al.* (1982), Atkins and Synder (1991), Buchanan (1992), Clavert (1992) and Boossbaly *et al.* (1993). Marks (1993) recorded ventricular premature contraction in cases of idiopathic cardiomyopathy. Patterson *et al.* (1961) reported conduction disturbances associated with a variety of heart disease including chronic heart disease. In an investigation on ICM, Calvert *et al.* (1982) and Bonagura (1981) obtained S-T segment changes in case of idiopathic cardiomyopathy. The present findings were in agreement with earlier reports. Further, they indicated the fact that there existed a close relationship between structure and function of myocardium and the observed changes in electrocardiogram were a result of existing cardiomyopathy.

The MEA recorded in the study with control animals were comparable to the findings of the Lannek (1949) and Joseph (1988). Deviation in MEA was observed only in 23 per cent cases of ICM. It consists of right axis deviation (85.71%) and left axis deviation (14.78% mean). Since mean electrical axis deviation is one among the criteria for determining chamber enlargement pattern by electrocardiogram, they have been taken into account along

with them.

Summary

Idiopathic cardiomyopathy is a primary heart muscle disease, usually of unknown etiology. Electrocardiography is the clinical method of choice to evaluate cardiac problems. The purpose of the present work was to evaluate the results of electrocardiogram findings and to report electrocardiogram, abnormalities in relation to ICM in dogs. All animals with idiopathic cardiomyopathy had electrocardiogram changes. The major electrocardiogram abnormalities recorded included chamber enlargement patterns, arrhythmias, conduction disturbances, low R amplitude and S-T segment changes.

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