



E-ISSN: 2320-7078

P-ISSN: 2349-6800

JEZS 2017; 5(6): 2508-2510

© 2017 JEZS

Received: 23-09-2017

Accepted: 27-10-2017

Sipra Panda

Department of Veterinary
Physiology, C.V.Sc & A.H.
Orissa University of Agriculture
and Technology, Bhubaneswar,
Odisha, India

Riddhi Pandey

Department of Veterinary
Physiology, C.V.Sc & A.H.
Orissa University of Agriculture
and Technology, Bhubaneswar,
Odisha, India

Swagat Mohapatra

Department of Veterinary
Physiology, C.V.Sc & A.H.
Orissa University of Agriculture
and Technology, Bhubaneswar,
Odisha, India

Pravas Ranjan Sahoo

Department of Veterinary
Biochemistry, C.V.Sc & A.H.
Orissa University of Agriculture
and Technology, Bhubaneswar,
Odisha, India

Tushar Jyotiranjana

Department of Veterinary
Physiology, C.V.Sc & A.H.
Orissa University of Agriculture
and Technology, Bhubaneswar,
Odisha, India

Akshaya Kumar Kundu

Department of Veterinary
Physiology, C.V.Sc & A.H.
Orissa University of Agriculture
and Technology, Bhubaneswar,
Odisha, India

Correspondence

Swagat Mohapatra

Department of Veterinary
Physiology, C.V.Sc & A.H.
Orissa University of Agriculture
and Technology, Bhubaneswar,
Odisha, India

The association of increased serum myocardial enzymes concentration with aberrations in the electrocardiograms of dogs

Sipra Panda, Riddhi Pandey, Swagat Mohapatra, Pravas Ranjan Sahoo, Tushar Jyotiranjana and Akshaya Kumar Kundu

Abstract

The study was undertaken to assess the concordance of increased serum myocardial enzymes and myocardial injury with certain aberrations in electrocardiograms of dogs. Labrador Retriever dogs aged between 5 to 10 years and showing symptoms of cardiac problems like nocturnal coughing, exercise intolerance, cyanotic mucus membrane, inappetance, edema etc were considered for the study and apparently healthy Labrador Retriever dogs aged between 5 to 10 years having no history of cardiac disorders were enzymatically screened to get control values. Electrocardiographic alterations like tall T waves were associated with increased serum levels of CKMB (Creatine Kinase MB isoenzyme), LDH (Lactate Dehydrogenase) and AST (Aspartate Aminotransferase) while ECG aberrations like ST segment abnormalities and arrhythmia were associated with increased levels of CKMB and LDH in the serum. Our study concluded that myocardial infarction might be the reason behind certain ECG findings which are often believed to be of non-ischemic origins.

Keywords: Cardiac markers, myocardial cells injury, abnormal ECG, Labrador Retriever Dogs.

1. Introduction

An electrocardiogram is the recording of electric potentials generated by the cardiac impulse by placing electrodes on the skin on opposite sides of the heart ^[1]. During recent years, highly cardiac specific enzymatic markers have been extensively assayed by the researchers to accurately predict myocardial cells injury. Assays of serum enzymes such as aspartate aminotransferase (AST), lactate dehydrogenase (LDH), creatine kinase (CK) and isoenzyme MB are widely performed in the early phase of suspected ischemic myocardial injury ^[2]. Clinicians often assume that hyperkalemia is the reason behind the tall T waves and rule out the possibility of myocardial cells injury. This leads to improper diagnosis of the case and might lead to the death of the animal. Literatures on serum myocardial enzymes level during myocardial injury are readily available but published reports of their association with different electrocardiographic abnormalities are rare. The present study was undertaken to assess the concordance of increased serum myocardial enzymes and myocardial injury with certain aberrations in electrocardiograms of dogs.

2. Materials and Methods

A twelve-lead standard ECG recorder, Maestros MRX-12 was used to record ECG in dogs. The electrocardiograph was set with a paper speed of 25 mm/sec and sensitivity of 1 (10 mm = 1 mV). Labrador Retriever dogs (n= 57) aged between 5 to 10 years and showing symptoms of cardiac problems like nocturnal coughing, exercise intolerance, cyanotic mucus membrane, inappetance, edema etc. were screened electrocardiographically out of which 18 dogs manifested abnormalities in electrocardiograms. Healthy Labrador Retriever dogs (n=10) aged between 5 to 10 years having no history of cardiac disorders were enzymatically and electrocardiographically screened to get control values. The ECG was recorded with the dog restrained in right lateral recumbency on an wooden table with electrodes attached to alligator forceps clipped over the skin of elbow joint and stifle joint ^[3]. Blood was collected from the cephalic vein of the dogs in plain vial without anticoagulant and serum was separated. The cardiac enzymatic markers viz. Creatine Kinase (CK) MB isoenzyme, Lactate Dehydrogenase

(LDH) and Aspartate aminotransferase (AST) were assayed from the serum using modified IFCC methods within 12 hours of blood collection.



Fig 1: A normal lead II electrocardiogram of a dog

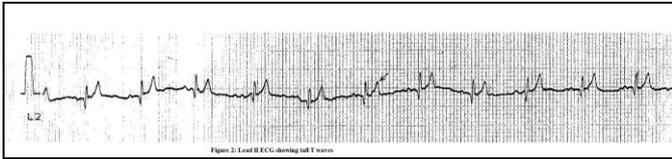


Fig 2: Lead II ECG showing tall T waves.

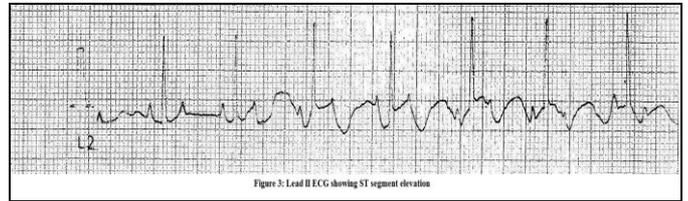


Fig 3: Lead II ECG showing ST segment elevation.

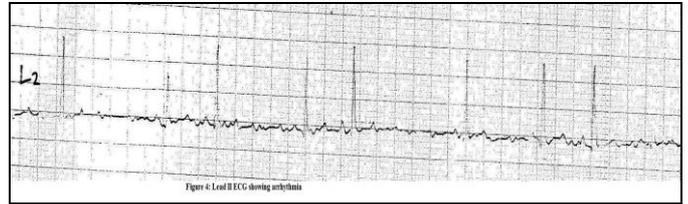


Fig 4: Lead II ECG showing arrhythmia.

Table 1: Serum Myocardial Enzymes concentration in dogs. (Mean \pm S.E.)

Sl. No.	Serum Myocardial Enzymes	Healthy dogs without Any electrocardiographic abnormality (Control)	Enzyme concentration during increased T wave amplitude (U/L)	Enzyme concentration during ST segment elevation or Depression (U/L)	Enzyme concentration during Arrhythmia (U/L)
1	CKMB	21.05 \pm 0.86	160.82 \pm 31.78	110.18 \pm 11.08	154.53 \pm 23.93
2	LDH	91.63 \pm 1.69	368.44 \pm 114.71	178.66 \pm 26.27	262.08 \pm 15.71
3	AST	30.33 \pm 2.11	34.35 \pm 10.96	30.47 \pm 10.09	30.71 \pm 6.06

3. Results and Discussion

The results of the current study are presented in Table 1. Sample electrocardiograms of healthy dogs and dogs with certain ECG abnormalities are presented in figures 1, 2, 3 and 4. On the basis of electrocardiographic evaluation, three types of aberrations were detected in the dogs included in this study viz increased amplitude of T waves (n=6), elevation or depression of ST segment (n=6) and cardiac arrhythmia (n=6). Serum analysis of dogs with increased T wave amplitude revealed an approximately eight fold increase in CKMB concentration and fourfold increase in LDH concentration. The T waves in electrocardiograms represent ventricular repolarisation. The amplitude of T waves in healthy dogs is around 0.25 of the R wave amplitude [4]. Hyperkalemia is believed to be one of the most common causes of prominent T waves [5]. In our study we found highly elevated levels of CKMB, LDH and AST in electrocardiograms of dogs featuring tall T waves in ECG suggesting damage or death of the myocardial cells. Our findings corroborate with the findings of Sovari *et al.* (2007) [6], who reported tall and broad based T waves during acute myocardial infarction (AMI) in the anterior pre-cordial leads of the 12 lead ECG recorder. The myocardial enzymes are mostly concentrated inside the cells. Any damage to the cells leads to leaking out of the enzymes into the blood leading to increased myocardial enzymes concentration in the serum. Thus, myocardial necrosis might be the reason behind our results.

Dogs with ST segment elevation or depression showed elevated levels of CKMB approximately five times and LDH levels around two times above the normal serum concentrations than in healthy dogs without any electrocardiographic abnormality taken as control. ST segment elevation or depression is primarily associated with myocardial ischemia [7]. Our studies reported elevated levels of CKMB and LDH associated with ST segment abnormalities thus confirming myocardial necrosis. We also

found elevated levels of serum myocardial enzymes during cardiac arrhythmia. The death of the myocardial cells might have resulted in non uniformity in cardiac cell impulse transmission leading to irregular spacing between R waves in the electrocardiograms of dogs. There are certain non-ischemic causes associated with ST segment elevation or depression like ventricular hypertrophy, bundle branch block etc. Similarly, the etiology of cardiac arrhythmia might have a cardiac or non-cardiac origin. The estimation of serum myocardial enzymes during certain aberrations in electrocardiograms of dogs gives us a confirmatory diagnosis of myocardial necrosis.

Elevated serum enzymatic concentrations of CKMB and LDH were also recorded in dogs with cardiac arrhythmia with an approximate increase over seven fold and three fold above their normal levels respectively. Mildly elevated levels of serum myocardial enzyme AST was recorded in few dogs, however serum AST concentration remained around the normal levels in all the three types of aberrations.

4. Conclusion

This study highlighted the association of serum myocardial enzymes with alterations in electrocardiograms which can be used as a differential diagnosis of myocardial infarction during certain electrocardiographic aberrations which have a possible non-ischemic cause.

5. References

- Guyton AC, Hall JE. Textbook of Medical Physiology. 11th Ed., Elsevier Saunders, Philadelphia, Pennsylvania. 2006; 123.
- Fontes JP, Goncalves M, and Ribeiro VG. Serum markers for ischemic myocardial damage. Rev Port Cardiol. 1999; 18(12):1129-36.
- Mohapatra S, Mahapatra APK, Pradhan SR, Kundu AK. Electrocardiographic Changes of Labrador dogs with age. Indian J Vet Sci Biotech. 2015; 10(4):19-22.

4. Tilley LP. Essentials of canine and feline electrocardiography: Interpretation and treatment, 3rd Ed., Lea and Febiger, Philadelphia, PA: Lea & Febiger. 1992, 1-470.
5. Somers MP, Brady WJ, Perron AD, Mattu A. The prominent T wave: Electrocardiographic differential diagnosis. *Am J Emerg Med.* 2002; 20(3):243-251.
6. Sovari AA, Assadi R, Lakshminarayanan B, Kocheril AG. Hyperacute T wave, the early sign of myocardial infarction. *Am. J Emerg Med.* 2007; 25(7):859.e1-859.e7.
7. Wang K, Asinger RW, Marriott HJL. ST-Segment Elevation in Conditions Other Than Acute Myocardial Infarction. *N Engl J Med.* 2003; 349:2128-35.