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Electrocardiographic findings and alterations of cardiac troponin in dogs with *Babesia gibsoni*

Dr. B Sudhakara Reddy, Dr. S Sivajothi and Dr. K Swetha

Abstract

The present study was carried out to record the electrocardiographic changes and alterations of cardiac troponin in dogs with *Babesia gibsoni*. Confirmation of the babesiosis was carried out by microscopic examination of stained peripheral blood smears. Recorded clinical signs were anorexia, pyrexia, lymphadenopathy, lethargy, pale conjunctival mucus membranes, changes in urine colour, petechial hemorrhages, vomiting, and icterus. Recorded abnormal electrocardiographic findings were elevated P wave amplitude, P wave duration, PR duration, QRS duration, increased T wave amplitude, reduced R wave amplitude, increased R wave amplitude, ST segment deviation, arrhythmia, tachycardia, and bradycardia. There is no change in the qualitative analysis of cardiac troponin I level in dogs with babesiosis. In the present study, none of the dogs showed a positive for cardiac troponin, which is indicative that there is no role in myocardial injury. The recorded electrocardiographic changes might be due to hemodynamic disturbances, alterations in conduction disturbances and non significance parasitic myocarditis.

Keywords: Babesia, electrocardiography, dogs, cardiac troponin

Introduction

Blood parasites can cause frequent anemia and associated changes on cardio vascular system (Champion *et al.*, 2013) [2]. Canine babesiosis is one of the significant haemoprotozoan diseases in dogs which can cause high mortality in complicated dogs. Recorded *Babesia* species in dogs are *Babesia canis* and *Babesia gibsoni* in Indian sub continent. All these organisms are transmitted mainly by ticks, blood transfusion and transplacental route. Recorded clinical signs in these cases expressive in per acute, acute and chronic form and they were based on the microbial virulence and host resistance. Much research was carried out on the clinical findings, laboratory changes in dogs with babesiosis (Sivajothi *et al.*, 2014, Bilwal *et al.*, 2017) [9, 1]. During the disease process, anemia triggers the hypoxia and associated myocarditis can cause arrhythmias and alterations in electrocardiography (Dvir *et al.*, 2004) [3]. Reports were available on electrocardiographic changes in dogs with babesiosis but electrocardiographic changes in relation to the cardiac troponin were very limited (Lobetti *et al.*, 2002) [5]. Hence present study was carried out to record the electrocardiographic changes and qualitative assessment of cardiac troponin levels in dogs with *Babesia gibsoni*.

Materials and Methods

Present study was carried out at Department of Veterinary Medicine, College of Veterinary Science, Proddatur from April to July 2022. During the study period, dogs with clinical signs suggestive of *Babesia gibsoni* were screened initially for the presence of diseases in the Clinic. Confirmation of the babesiosis was carried out by the microscopic examination of stained peripheral blood smears (Fig.2) (Sivajothi and Reddy, 2017) [10]. For the present study, six dogs were selected and electrocardiography was carried out as per standard procedure using the standard bipolar and augmented unipolar limb leads at 25 mm/sec and interpreted as described by (Tilley *et al.*, 2008) [12]. The three standard bipolar limb leads (I, II, III) and the augmented unipolar limb leads (aVR, aVL, aVF) were recorded with the dogs in the right lateral recumbency position. All recordings were standardized at 1 mV = 10 mm, with a chart speed of 25 mm/s. The morphology of P waves, QRS complexes, and T waves were analyzed in all the leads. Cardiac rhythm, heart rate, amplitude, and duration of P, QRS, and T waves, as well as the PR interval and QT interval, were calculated in lead II. The data were expressed as mean \pm standard deviation. Blood was collected to carry out the qualitative cardiac troponin I test as per test kit method.

Results and Discussion

The observed clinical signs in canine babesiosis were anorexia, pyrexia, lymphadenopathy, weakness, lethargy, pale conjunctival mucus membranes, change in urine colour, petechial haemorrhages, vomiting and icterus (Fig.1). Reported clinical signs in the present study due to release of endogenous pyrogens after erythrolysis and activation of inflammatory mediators (Koster *et al.*, 2015) [4]. Petechial haemorrhages were observed in the present study, which might be due to thrombocytopenia predisposing to disseminated intravascular coagulopathy. Observations of these findings were might be due to hepatopathy and which causes increase in bilirubin level above normal range (Reddy *et al.*, 2014) [7].

Electrocardiographic findings documented in the present study were in Table 1 and 2. Recorded abnormal electrocardiographic findings were elevated P wave amplitude and P wave duration, PR duration, QRS duration, increased T wave amplitude, reduced R wave amplitude, increased R wave amplitude, ST segment deviation, arrhythmia, tachycardia and bradycardia.

Abnormal P wave configuration, irregular rhythm due to SA node pathology by the changes in the heart might be associated with myocarditis and vagal irritation (Robinsob *et al.*, 1981) [8]. Low R-amplitude, low QRS voltage was noticed which indicative of presence of fluid accumulation in the pericardial and pleural space. Other possible pathology for low R-amplitude include myocardial infarction, loss of myocardial electrical activity and contractile failure (Lobetti, 2005) [6]. Documented sinus bradycardia and irregularity in the heart rhythm indicative of negative prognostic indicator and it might be due to increased parasympathetic stimulation or presence of any primary pathology within the heart such as ischemia or SA node disease. Myocardial hemorrhages have been reported in hypoxia, acute infectious diseases, and disseminated intravascular coagulation, all of which are part of the described pathogenesis of canine babesiosis. T wave amplitude increases with hyperkalemia which was resulted from potassium ion efflux from RBC due to intravascular and extravascular hemolysis. Different other electrocardiography findings were noticed by the other researchers which indicative of patho-physiology of canine babesiosis (Sivajothi *et al.*, 2022) [11].

Present study data indicative of anemia in dogs can cause electrocardiographic changes suggestive of atrioventricular overload or hemodynamic disturbances. But in the present study none of the dogs showed the positive for cardiac troponin which indicative there is no role of significant myocardial injury. In the present study sample size was limited and all the dogs with clinical presentation were early to the clinic and these may not be having acute insult to the myocardium. Further studies are recommending documenting the changes during the chronic infection with bigger sample volume.

Table 1: Amplitude in millivolts (mV) of the Lead-II of electrocardiography

Parameters	Dog with Babesiosis (n=6)	
	(Mean ± SD)	Range
P wave	0.13±0.01	0.10 to 0.20
R wave	0.82±0.31	0.50 to 3.0
T wave	0.51±0.05	0.6 to 0.1.6

Table 2: Duration in seconds (sec) of the Lead-II of electrocardiography

Parameters	Dog with Babesiosis (n=6)	
	(Mean ± SD)	Range
P wave	0.044±0.001	0.04 to 0.06
QRS complex	0.044±0.003	0.04 to 0.06
T wave	0.037±0.012	0.02 to 0.06
PR duration	0.088±0.02	0.08 to 0.10
QT deviation	0.26±0.026	0.12 to 0.34
Heart rate (bpm)	126.99±18.6	68-152

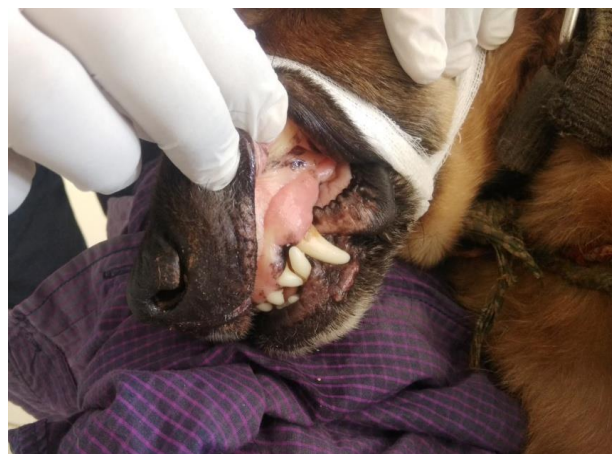


Fig 1: Dog showing the yellowish mucus membranes

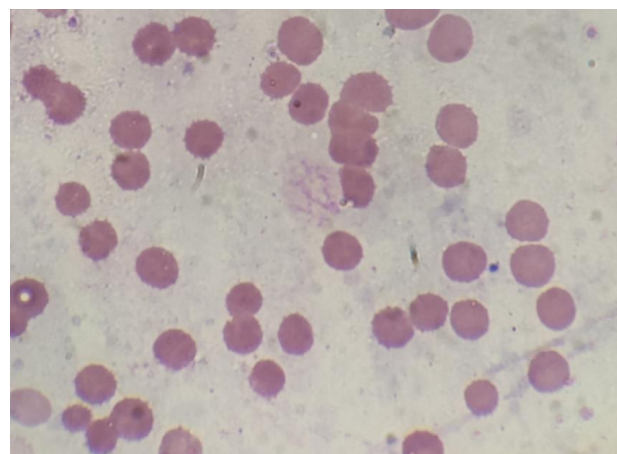


Fig 2: Blood smear examination showing the *Babesia gibsoni* organisms (1000X)

Conclusion

Documented electrocardiographic findings in the present study might be due to anemia, alterations in the conduction system and development of the non significant parasitic myocarditis.

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