



SHORT COMMUNICATION

Electrocardiographic Evaluation in Anemic Dogs with Blood Parasitosis

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ABSTRACT

The present study was conducted on dogs presented to Medicine OPD of Small Animal Clinics of the Department of Teaching Veterinary Clinical Complex, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana. In the present study ECG was done in 23 dogs suffering from haemolytic anaemia (12 dogs with *Ehrlichia canis* and 11 with *Babesia* spp.) Among the cardiac rhythms assessed by electrocardiography, sinus arrhythmia occurred most frequently (82.61%). Sinus tachycardia was seen in 20 (86.96%) dogs in the present study. Abnormalities in the ST-segment (ST depression and elevation) were found in 5 (21.74%) anemic dogs and slurring of ST segment in 3 dogs.

Keywords: Anaemia, *Babesia*, dogs, *Ehrlichia*

Anemia is defined as a decrease in the concentration of haemoglobin and/or red blood cells per unit volume of blood. If it is due to increased red blood cell breakdown it is called hemolytic anaemia and occurs commonly in dogs with variable degree of severity. Hemolytic anaemias are typically regenerative and result from lysis of RBCs in either intra or extravascular space. Intravascular hemolysis results in hemoglobinemia and hemoglobinuria, whereas extravascular hemolysis does not. The decrease in the red cell mass leads to reduced oxygen transport which results to tissue hypoxia and hemodynamic and non-hemodynamic compensatory events (Champion *et al.*, 2011; Champion *et al.*, 2013).

The non-hemodynamic changes include the decrease in the affinity of hemoglobin for oxygen and an increase in erythropoietin production (Metivier *et al.*, 2000). But the hemodynamic events, are related to increased sympathetic activity with consequent increases in cardiac output and a decrease in systemic vascular resistance due to arterial vasodilation and reduced viscosity (Aird, 2000; Metivier *et al.*, 2000).

Ehrlichiosis and babesiosis are common causes of anaemia and may lead to myocardial injury viz., myocarditis and

then subsequent development of arrhythmias (Lobetti 2005; Diniz *et al* 2008). The electrocardiogram (ECG) is a useful test for the diagnosis of arrhythmias, but it can also be used to evaluate signs of cardiac chambers enlargement and disorders related to myocardial hypoxia (Tilley, 1995). Because of the possibility of electrocardiographic changes resulting from hemodynamic dysfunction in conditions such as anemia and the possibility of cardiac injury caused by hemoparasitosis, this study aimed to evaluate the electrocardiographic parameters in anemic dogs due to natural infection by *Erlichia canis* and *Babesia canis*.

Blood smears were screened for hemoprotozoa (*Babesia*) and Rickettsia (*Ehrlichia canis*) for that blood was collected aseptically from the cephalic or saphenous vein, using a dry sterile syringe and was immediately transferred to a vial containing Ethylene-Diamine Tetra-Acetate (EDTA) as an anticoagulant. The blood smears were stained by the standard Giemsa staining method and examined immediately microscope. Among the positive cases of hemoprotozoa (*Babesia*) or Rickettsia (*Ehrlichia canis*), ECG was performed. ECG was done by standard lead system (Bailey's hexaxial lead system) in dogs. Dogs were made to lie on the right lateral recumbency on a

wooden table. ECG was taken by using Bailey's hexaxial lead system. Gel was applied above the elbow joint (olecranon process) on both forelegs and slightly above stifle joint on the hind legs. All the abnormalities were detected from lead II tracing. The speed of ECG paper was 50 mm/sec and sensitivity was adjusted to one.

In the present study ECG was done in 23 dogs suffering from haemolytic anaemia (12 dogs with *Ehrlichia canis* and 11 with *Babesia* spp.) Among the cardiac rhythms assessed by electrocardiography, sinus arrhythmia occurred most frequently (82.61%) (Fig. 1) in dogs. Similar findings were reported by Champion *et al.*, (2013). Ehrlichiosis and babesiosis are frequent causes of anaemia and may lead to myocardial injury, such as myocarditis and then subsequent development of arrhythmias (Lobetti, 2005, Diniz *et al.*, 2008). Heartbeat intervals in resting humans and animals also show fluctuations linked with respiration, a phenomenon known as respiratory sinus arrhythmia (RSA). Since its first description by Ludwig in 1847, mechanisms mediating RSA have been the focus of many studies and are now understood to be modulation

of the cardiac vagal efferent activity by the central respiratory drive and gating of excitatory input to the vagal motor neurons by the lung inflation reflex (Shykoff *et al.*, 1991; Horner *et al.*, 1995). Also, the degree of RSA is known to increase with cardiac vagal activation (Fouad *et al.*, 1984; Hayano *et al.*, 1991). Sinus tachycardia was seen in 20 (86.96%) dogs in the present study (Fig. 2). The heart rate increases in anaemia due to hypoxia-stimulated chemoreceptors and increased sympathetic activity (Metivier *et al.*, 2000).

Abnormalities in the ST-segment (ST depression and elevation) were found in 5 (21.74%) anemic dogs and slurring of ST segment (Fig. 3) in 3 dogs which may be suggestive of left ventricular repolarization and or ventricular hypertrophy (Champion *et al.*, 2013; Nelson and Couto, 2014). Similar findings have been reported earlier (Champion *et al.*, 2013). It is presumed that this may be due to the preservation of tissue oxygenation and the absence of myocardial hypoxia in dogs with mild anaemia because ST abnormalities are related to damage in ventricular repolarization (Tilley, 1992; Champion *et al.*, 2013).

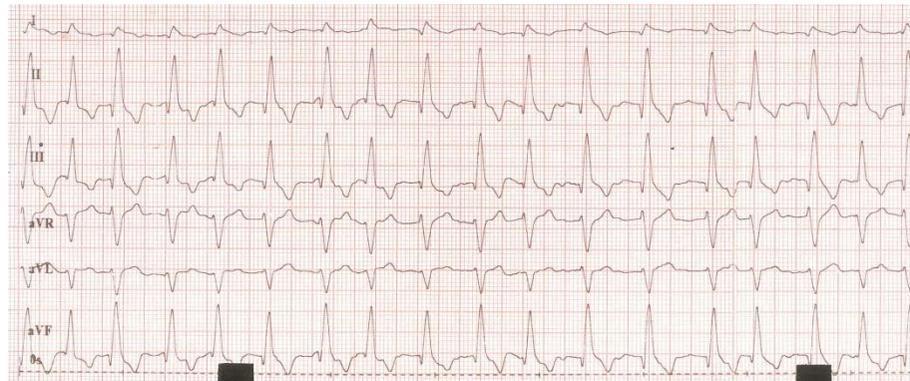


Fig. 1: Sinus arrhythmia (indicated by variation in R-R interval)

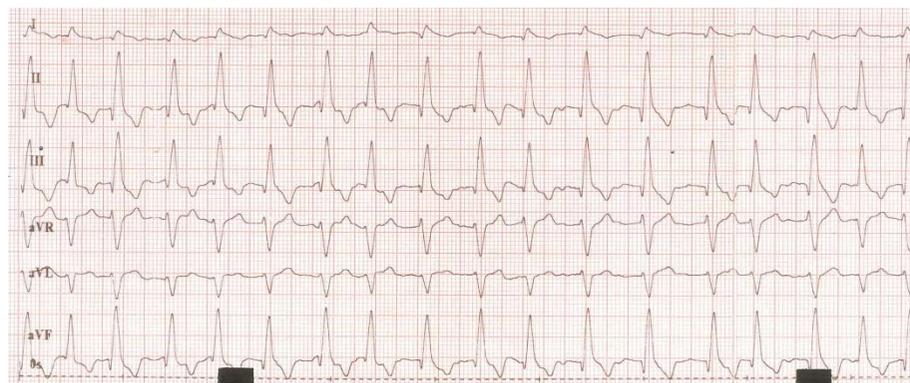


Fig. 2: Sinus tachycardia (indicated by increased heart rate with no change in morphology of P wave)

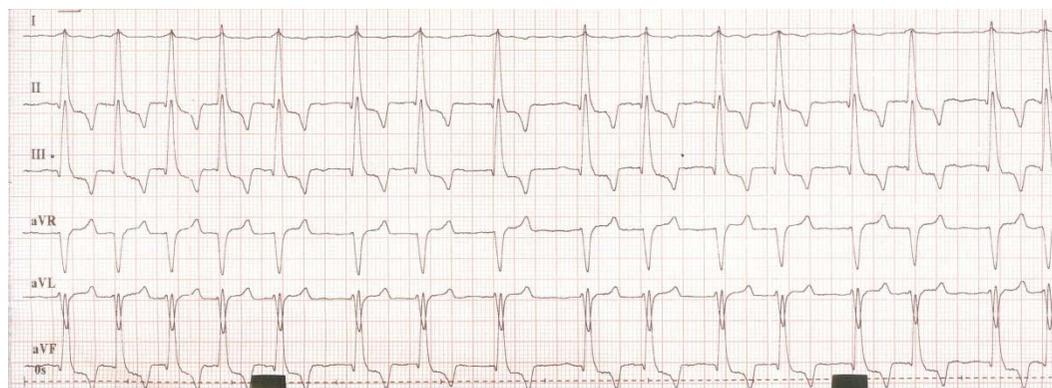


Fig. 3: ST slurring (indicated by dipping of ST segment below base line)

Electrocardiographic changes may occur in dogs with anemia with sympathetic activation, like increased heart rate and a decreased respiratory sinus arrhythmia. Among the cardiac rhythms assessed by electrocardiography, sinus arrhythmia occurred most frequently (82.61%) in dogs with hemoprotozoan infections. Despite of the changes in repolarization suggestive of myocardial hypoxia, it was seen that as the amplitude of the T wave gets increased but an elevation in the ST segment was not very regularly found.

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