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Studies on Electrocardiographic Changes in Dogs with Canine Parvovirus Infection

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A B S T R A C T

The present communication reports the electrocardiographic changes in 18 young dogs with canine parvovirus infection aged between 2 months to 6 months. Canine parvovirus infection was confirmed by the detection of antigen in the dog faecal samples by rapid CPV test kit with principle of chromatographic immunoassay. Recorded abnormal electrocardiographic findings were tachycardia, shortening of QT interval, low T wave amplitude, ST-segment elevation, increased P wave amplitude, ST coving, reduced R wave amplitude and deep S wave. The recorded electrocardiographic changes might be due to electrolyte and hemodynamic disturbances, alterations in conduction mechanisms or viral myocarditis.

Introduction

Parvovirus infection is considered the most common disease in young dogs. It is highly contagious from one dog to another, spread by direct or indirect contact with infected dogs. The virus requires rapidly dividing cells for its replication and commonly documented distinct presentations were cardiac and intestinal form Goddard and Leisewitz (2010). For the physician, it is essential to predict the prognosis of the diseases on the day of presentation and subsequent days during follow-up visits. It was documented that hypercoagulability without disseminated intravascular coagulopathy was noticed in young puppies with enteritis (Otto *et al.,* 2000). Puppies suspected of viral myocarditis showed low R waves, S-T segment elevation, QRS notching and paroxysmal ventricular tachycardia (Areshkumar *et al.,* 2018). Treatment of canine parvovirus infection by crystalloids solutions by electrolytes and colloids for management of hypovolemic shock in dogs (Sen *et al.,* 2014).

Electrocardiography is considered a non-invasive and inexpensive method of detecting or recording cardiac abnormalities in dogs. Very limited information was available on the electrocardiographic changes in young puppies with haemorrhagic gastroenteritis (Sravanthi *et al.,* 2019).

Materials and Methods

Present pilot work was carried out to record the electrocardiographic findings in dogs with parvo virus infection at the Department of Veterinary Medicine, College of Veterinary Science, Proddatur.

Dogs with a history of bloody diarrhea were selected. Confirmation of the parvovirus infection was carried out by the antigen detection test kit in the faecal samples. The antigen rapid CPV test kit is a chromatographic immunoassay for the qualitative detection of canine parvovirus antigen in canine faeces (Decaro *et al.,* 2010).

Electrocardiography was carried out as per the standard procedure by keeping the dogs in right lateral position, using the standard bipolar and augmented unipolar limb leads as described by (Tilley *et al.,* 2008). All the recordings were standardized at 1 mV/10 mm, with a chart speed of 25 mm/sec. The morphology of P waves, QRS complexes, and T waves were analyzed and cardiac rhythm, 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 ± standard error. To compare the electrocardiographic parameters in the diseased dogs, electrocardiography was carried out in the healthy puppies aged between 2 months to 6 months and took the parameters as a reference range.

Results and Discussion

For the present study, eighteen dogs aged between 2 months to 6 months belonged to different breeds were selected. The commonly noticed signs were vomiting, abdominal pain evincing posture, subnormal temperature, dullness, pale and dry conjunctival mucus membranes, increased capillary refill time and increased skin tenting test time (Fig.1). Electrocardiographic findings documented in the present study were in Table 1.

Recorded abnormal electrocardiographic findings were tachycardia (88.89%), shortening of QT interval (83.33%), low T wave amplitude (66.67%), ST-segment elevation (61.11%), increased P wave amplitude (55.56%), ST coving (38.89%), reduced R wave amplitude (33.33%) and deep S wave (27.78%). Electrocardiographic changes were recorded by the few authors in different breeds of dogs. Areshkumar *et al.,* (2018) documented the decrease in R wave amplitude and the shortening of QT interval in dogs died due to parvovirus infection (Areshkumar *et al.,* 2018) and sinus tachycardia, low T wave amplitude and duration was significantly different between survived and non survived dogs with parvovirus infection (Kubesy *et al.,* 2019).

In the present study, low R amplitude and low QRS voltage was noticed which are indicative of the presence of fluid accumulation in the pericardial space or myocardial infarction, loss of myocardial electrical activity and contractile failure. Elevation in the ST segment may be influenced by myocardial hypoxia.

Frequent vomiting and diarrhoea, loss of chlorides, potassium which increase in the heart rate and shortening of the QT time. Low voltage T wave documented in the present study was due to low level of serum potassium levels which may be loss by frequent vomitions and diarrhoea. In dogs it is believed that myocardial dysfunction is one of the complications of sepsis (Otto *et al.,* 2000). In the present study arrhythmia, tachycardia was recorded and it might be due to the metabolic destruction of cardiac cells during severe diarrhoea or by viral myocarditis.

Documented irregularity in the heart rhythm is indicative of negative prognostic indicators in dogs with haemorrahgic enteritis and it might be due to increased parasympathetic stimulation (Reddy *et al.,* 2022). In the present study assessment of electrocardiography changes were carried out with a minimum sample size. Further studies are recommended recording the electrocardiographic changes during the different stages of infection in a large sample size.

Reported electrocardiographic findings in the present study were might be due to anaemia, alterations in the conduction system and the development of viral myocarditis.

Table.1 Electrocardiographic parameters in dogs with canine parvovirus infection

Parameters	Apparently healthy dogs (n=6)	Dogs with canine parvo viral infection (n=6)	P value
P wave amplitude (mV)	$0.19^{a}\pm0.011$	$0.23^{b}\pm0.029$	0.03*
QRS amplitude (mV)	$1.23^{b}\pm0.004$	$1.02^{a}\pm0.006$	0.04*
T wave amplitude (mV)	$0.35^{b}\pm0.021$	$0.25^{a}\pm0.038$	0.03*
P wave duration (Sec)	$0.04^{a}\pm0.016$	$0.03^{a}\pm0.018$	0.08^{NS}
QRS complex duration (Sec)	$0.04^{a}\pm0.022$	$0.03^{a}\pm0.016$	0.07^{NS}
T wave duration (Sec)	$0.04^{a}\pm0.038$	$0.04^{a}\pm0.016$	0.08^{NS}
PR interval (Sec)	$0.12^{b}\pm0.002$	$0.09^{a}\pm0.049$	0.03*
QT interval (Sec)	$0.20^{b}\pm0.004$	$0.13^{a}\pm0.019$	0.02*

*P<0.05;^{NS}P>0.05;^{abc}Columns bearing different superscripts differ significantly.

Figure.1 Haemorrahgic gastroenteritis – Common signs of Parvovirus infection

Figure.2 Canine parvovirus infection – Rapid CPV antigen diagnostic test

Figure.3a Tachycardia, deep S wave and elevation of ST segment

Figure.3b Low voltage QRS and T wave

Figure.3c Tachycardia and ST coving

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