SHORT COMMUNICATION

Studies on Electrocardiograpic and Echocardiograpic Changes in Canine Parvovirus Infected Dogs

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Abstract

Canine parvoviral infection is a highly contagious disease that often results in systemic complications, including myocardial involvement. The present study evaluated cardiac function in canine parvovirus (CPV) infected dogs to characterize myocardial involvement. Thirty-six CPV infected and six healthy control dogs, under one year of age, underwent electrocardiography (ECG) and right parasternal echocardiography. The sinus arrhythmia, wandering pacemaker, increased Q-wave amplitude, ST elevation, tachycardia and shorter P-amplitude, PR and QT intervals were the ECG abnormalities recorded. Echocardiographic indices did not differ significantly between groups, consistent with acute, non-structural myocardial injury. Findings of the present study support routine ECG monitoring in CPV cases to detect conduction disturbances and structural changes may be absent in acute disease.

Key words: Canine parvovirus, Conduction disturbances, Echocardiography, Electrocardiography.

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Introduction

Canine parvovirus (CPV) is a major pathogen of dogs, with well documented gastrointestinal disease and rarely cardiac involvement that can include myocarditis, arrhythmias and progressive heart failure, particularly in very young puppies. Viral tropism for dividing cardiomyocytes can lead to necrotizing myocarditis or delayed fibrotic remodelling (Gulersoy *et al.*, 2020; Dines *et al.*, 2023; Oikonomidis *et al.*, 2023). The CPV-2 myocardial infection is an underrecognized cause of myocarditis and myocardial fibrosis in young dogs and electrocardiography (ECG) surveillance must be a part of comprehensive care in suspected CPV cases to guide timely interventions (Rana and Sharma, 2023). Echocardiography offers non-invasive modality for assessment of heart morphology and function (Dines *et al.*, 2023). The present study assessed the ECG and echocardiographic changes in CPV infected dogs.

Materials and Methods

The study population comprised of 36 conventional PCR confirmed CPV infected dogs below one year of age that were presented to the Department of Veterinary Medicine, Veterinary College, Bengaluru (India). Six apparently healthy dogs, less than one year of age were included in the control group. The ECG of the dogs was done using BPL Cardiart 9108 electrocardiograph (BPL medical technologies, India). The dogs were placed in a right lateral recumbency on a wooden table. The ECG leads were connected to respective limbs, using alligator clips, after applying conductive gel on the skin. The ECG was recorded at 25 mm/s and 50 mm/s speeds and interpreted. Echocardiography was done using P8-2 veterinary phased array transducer (2.1-8.2 MHz) of VETUS-5 ultrasound machine (Mindray Animal Care, China). Animals were positioned in right lateral recumbency in such a way that the third to fifth inter-coastal space aligned with the window of the table. Phased array probe was placed at the point-of-maximum intensity of heart sounds. Right parasternal longitudinal and cross-sectional views at different levels were taken. The measurements were made at level of left ventricular papillary muscles, using Teichoiz software.

The numerical data collected in this study from both healthy and CPV infection suspected dogs were analysed

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using SPSS software (IBM, USA) and independent t-test was used to evaluate the level of significance.

Results And Discussion

Sinus arrhythmia (Fig. 1) was the most frequently recorded abnormality, occurring in 52.77 % of the CPV infected dogs. Wandering pacemaker was observed in 25.00 %. Increased Q-wave amplitude (Fig. 2) greater than 0.4 mV was detected in 47.22 %, while reduced QT duration (<0.16 s) was observed in 30.5 % dogs. The ST segment elevation greater than 0.2 mV was noted in 22.22 % CPV cases. The ECG parameters observed in CPV infected dogs compared with control group are presented in Table 1. The ECG changes in CPV infected dogs may result from sympathetic stimulation, tachycardia, altered ventricular depolarization and disrupted pacemaker activity due to CPV-induced myocarditis, causing conduction disturbances (Needle and Mietelka, 2014; Gulersoy *et al.*, 2020; Oikonomidis *et al.*, 2023). The ECG changes observed in CPV infected dogs indicate a measurable and clinically significant myocardial impact of the CPV (Ford *et al.*, 2017; Dines *et al.*, 2023; Rana and Sharma, 2023; Stancu *et al.*, 2025).

Table 1: Mean (± SE) values of various electrocardiographic parameters in CPV infected dogs compared to control group

ECG parameters	Control group	CPV infected dogs
P wave - Amplitude (mV)	0.12 ± 0.016	0.16 ± 0.0041
P wave - Duration (sec)	0.04 ± 0.00041	0.00033*
Q wave - Amplitude (mV)	0.17 ± 0.00245	0.42 ± 0.0033**
R wave - Amplitude (mV)	1.78 ± 0.14	1.40 ± 0.010*
QRS duration (sec)	0.05 ± 0.0041	0.05 ± 0.00049
T wave - Amplitude (mV)	0.15 ± 0.016	0.15 ± 0.0016
PR interval (sec)	0.09 ± 0.0082	0.06 ± 0.00065*
QT interval (sec)	0.16 ± 0.016	0.13 ± 0.0016*
Heart rate (bpm)	124.0 ± 3.14	141.30 ± 1.08**

* = p < 0.05 (significant); ** = p < 0.01 (highly significant)

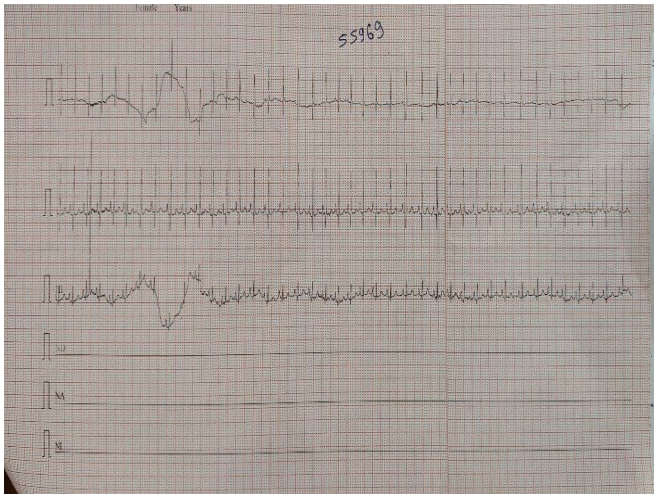

Fig. 1: Sinus arrythmia

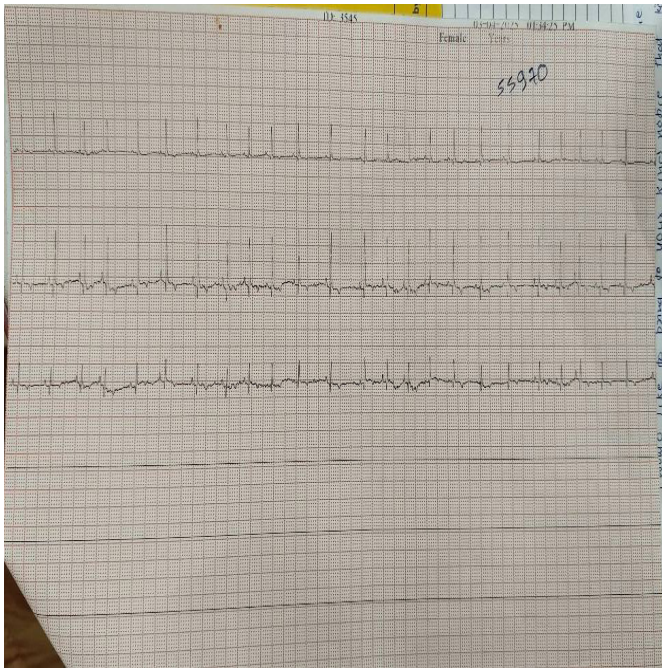

Fig. 2: Increased Q-amplitude

The echocardiographic parameters recorded in CPV infected dogs compared with control group are presented in Table 2. The echocardiography revealed no structural abnormalities of heart in the CPV infected dogs, possibly due to the acute nature of the myocardial injury in the CPV infection (Kilian *et al.*, 2018; De Abreu *et al.*, 2021; Dines *et al.*, 2023).

Table 2: Mean (± SE) values of various echocardiographic parameters in CPV infected dogs

Parameter	Control group	CPV infected dogs
Left ventricular internal diameter in end-diastole (LVIDd) (mm)	23.84 ± 0.10	23.89 ± 0.11
Left ventricular internal diameter in end-systole (LVIDs) (mm)	16.58 ± 0.10	16.59 ± 0.11
End-diastolic volume (EDV) (mL)	19.85 ± 0.20	19.92 ± 0.17
End-systolic volume (ESV) (mL)	7.88 ± 0.12	8.01 ± 0.10
Stroke volume (SV) (mL)	11.97 ± 0.24	11.91 ± 0.18
Ejection fraction (EF) (%)	60.14 ± 0.81	59.92 ± 0.57
Fractional shortening (FS) (%)	30.42 ± 0.52	30.41 ± 0.49

*p < 0.05 (significant); **p < 0.01 (highly significant)

In conclusion, the ECG revealed frequent conduction abnormalities in CPV infected dogs, indicating measurable myocardial involvement despite largely normal echocardiographic indices, consistent with acute, non-structural injury. These findings support routine ECG surveillance in suspected CPV to detect conduction abnormalities. Absence of echocardiographic differences suggests structural sequelae may be delayed.

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