SHORT COMMUNICATION

Clinical Lesions in Parvo Virus Infected Puppies

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Abstract

Canine parvo virus (CPV) causes acute gastroenteritis in young puppies leading to profuse diarrhoea and vomiting, severe dehydration/ hypovolemia, metabolic acidosis (or alkalosis), bacterial translocation with septicaemia and endotoxemia, systemic inflammatory response syndrome (SIRS), hypercoagulability, multiorgan dysfunction, and death. CPV invades many of the internal organs such as intestinal epithelia, bone marrow, tongue, oral cavity, heart, lung, spleen, liver, kidneys and skin. In PCR positive puppies, petechial haemorrhages were observed along the tip of the eyelids, along the tip line of the lips, around the inguinal region in male puppies, around perineal region in both male and females. These lesions were focal as a single and cluster like appearance.

Keywords: Lesions, Parvo virus, Petechial haemorrhage

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Introduction

Canine parvo viral infection, caused by three variants of canine parvovirus type 2 such as 2a, 2b and 2c which belongs to family Parvoviridae, Genus Parvovirus is a leading cause of morbidity and mortality in dogs globally (Goddard and Leisewitz, 2010; Sykes, 2014). All three variants are thought to have similar pathogenicity leading to indistinguishable clinical disease (Decaro and Buonavoglia, 2012; Marcovich *et al*., 2012). Severe clinical disease typically occurs in dogs younger than 6 months of age, adults with insufficient immunity may potentially be affected (Kalli *et al*., 2010; Marcovich *et al*., 2012). CPV-2 targets rapidly dividing cells of the intestinal epithelial crypts, bone marrow, epithelium of the tongue, oral cavity, and cardiac myocytes, in addition to lung, spleen, liver, and kidneys (Ford *et al*., 2017). The clinical manifestations of CPV-2 infection are nonspecific or referable to enteritis, commonly including anorexia or lethargy, weakness, depression, foul-smelling diarrhoea, which may range from mucoid to purely haemorrhagic, vomiting, dehydration, and fever (Houston *et al.,* 1996: Kalli *et al.,* 2010). Hence the present study was conducted to record the clinical signs occurring in puppies with parvoviral gastroenteritis.

Materials and Methods

The present study was conducted in Veterinary College Hospital, Department of Medicine, Hebbal, Bengaluru, Karnataka (India). Clinical data was collected from 50 puppies presented to the hospital suffering with gastroenteritis suggestive of parvoviral infection on the day of presentation. Fresh fecal samples were collected from these puppies and subjected to conventional PCR for confirmatory diagnosis of CPV antigen. Ten apparently healthy puppies irrespective of breed and gender of less than one-year age having no vices or observable abnormalities and free from any kind of ailments, brought for regular health examination and vaccination were opted and considered as healthy animals.

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Results and Discussion

The results presented in Tables 1 and 2 revealed that out of 50 fecal samples from puppies suspected for parvo viral gastroenteritis, 39 samples (78.00%) were found positive for CPV antigen with conventional PCR and 11 samples (22.00%) were found negative.

Anorexia was observed in all CPV positive puppies. Anorexia in CPV affected puppies may be attributed to intestinal mucosal barrier disruption, villous atrophy and malabsorption because of viraemia. Mazzaferro (2020), Gulersoy and Naseri (2022) and Abdullaziz *et al.* (2022) also reported anorexia in CPV infected puppies.

Diarrhoea was observed in 97.44 % of CPV positive puppies. Among the diarrhoeic puppies, 63.16 % puppies were having haemorrhagic diarrhoea, while 36.84 % puppies were having non-haemorrhagic diarrhoea and 57.89 % puppies were shedding mucosal sloughs in their feces. The haemorrhagic diarrhoea may be due to consequence of endotoxemia and cytokine production from

enteropathogens, sloughing of the intestinal mucosal lining, erosive inflammatory damage of the stomach and intestinal mucosal barrier. The variation in occurrence of haemorrhagic or non-haemorrhagic diarrhoea depends on sloughing of intestinal epithelia, damage to the intestinal crypts and villi, intestinal capillary rupture and severity could depend on the strain of the CPV antigen. Rallis *et al.* (2000) and Alves *et al.* (2020) also reported diarrhoea in CPV affected puppies and reported both haemorrhagic or non-haemorrhagic diarrhoea, whereas Mazzaferro (2020), Gulersoy and Naseri (2022) and Abdullaziz *et al.* (2022) reported haemorrhagic diarrhoea in CPV affected puppies.

Vomiting was observed in 94.87 % of CPV positive puppies. Alves *et al.* (2020), Gulersoy and Naseri (2022) and Abdullaziz *et al.* (2022) reported higher occurrence of vomiting in CPV affected puppies. Vomiting was most likely due to endotoxin-induced activation of the cytokine cascade, leading to local irritation and central activation of the emetic center and chemoreceptor trigger zone and destruction of intestinal crypt cells and abnormal intestinal motility.

Lethargy was observed in 94.87 % of CPV positive puppies. Mazzaferro (2020), Gulersoy and Naseri (2022) and Abdullaziz *et al.* (2022) also reported lethargy in CPV infected puppies. The systemic inflammatory changes occurred due to viremia might be the reason for lethargy.

Debility was observed in 92.31 % of CPV positive puppies. Goddard and Leisewitz (2010), Dogra and Sood (2016) and Khare *et al.* (2020) also reported debility in CPV infected puppies. Malnutrition, anorexia, viremia, systemic inflammatory changes loss of muscle mass might be the reason for debility.

Dehydration was observed in 82.05 % of CPV positive puppies. The dehydration was due to large amount of fluid and protein losses through the gastrointestinal tract as a result of vomiting and diarrhoea. Sykes (2014), Mazzaferro (2020), Alves *et al.* (2020) and Abdullaziz *et al.* (2022) also reported dehydration in CPV infected puppies.

Abdominal pain was observed in 79.49 % of CPV positive puppies. The abdominal pain may be due to acute gastroenteritis and the small intestinal intussusception which will create a painful, firm, tubular soft tissue mass found on abdominal palpation. Goddard and Leisewitz (2010), Kalli *et al.* (2010) and Sykes (2014) also reported abdominal pain in CPV infected puppies.

Recumbency was observed in 28.21 % of CPV positive puppies. The recumbency in the CPV affected puppies could be due to loss of fluid, essential electrolytes such as potassium, sodium, chloride, calcium, phosphorus through vomiting and diarrhoea. Viremia, malnutrition, anorexia, loss of muscle mass can also implicate the occurrence of recumbency in CPV affected puppies.

Conjunctival mucus membrane was congested in 53.85 % of CPV positive puppies and pale in 17.95 % puppies. Oral mucus membrane was congested in 15.38 % of CPV positive puppies and pale in 43.59 % puppies. Kalli *et al.* (2010) and Gulersoy and Naseri (2022) reported mucosal pallor and hyperemia in CPV infected puppies. Higher occurrence of mucosal congestion was observed in CPV affected puppies. This might be because the mucus membrane will be congested in the early stage of the disease, as the disease progresses to haemorrhagic diarrhoea mucus membrane will become pale.

The palpable popliteal lymph nodes were enlarged in one puppy while no abnormal changes observed in 82.05 % of CPV positive puppies. Gulersoy and Naseri (2022) also reported lymphadenopathy in CPV positive puppies and attributed to viremia or secondary bacterial infection.

Increase in mean rectal temperature (102.09±0.26 °F) was observed in CPV positive puppies compared to healthy puppies (101.61±0.07 °F). Gulersoy and Naseri (2022), Gulersoy and Ekici (2022) and Abdullaziz *et al.* (2022) also reported increased rectal temperature in CPV infected puppies. The reason for increased rectal temperature might be due to viremia, SIRS as a primary defence mechanism.

The capillary refill time (CRT) was prolonged (2.72±0 sec) in CPV positive puppies compared to healthy puppies (2±0 sec). Rallis *et al.* (2000), Gulersoy *et al.* (2022) and Abdullaziz *et al.* (2022) reported prolonged CRT, whereas Gulersoy and Naseri (2022) and Gulersoy and Ekici (2022) reported short or normal CRT in CPV infected puppies. Prolonged CRT may be due to impairment in tissue perfusion, systemic inflammatory changes and haemodynamic response to maintain tissue perfusion, dehydration associated with large fluid and protein losses through damaged gastrointestinal tract.

Increased heart rate (125.23±0.68 beats/min) was observed in CPV positive puppies compared to healthy puppies (120±0 beats/min). Alves *et al.* (2020), Gulersoy and Ekici (2022) and Abdullaziz *et al.* (2022) reported increased heart rate in CPV infected puppies. In contrast, Gulersoy and Naseri (2022) reported decreased heart rate in non-septic parvoviral enteritis compared to septic parvoviral enteritis. The increased heart rate may be due to dehydration, anaemia and SIRS.

Increased respiratory rate (42.43±1.36 breaths/min) was observed in CPV positive puppies compared to healthy puppies (36.6±2.23 breaths/min). Gulersoy and Naseri (2022), Gulersoy and Ekici (2022) and Abdullaziz *et al.* (2022) reported increased respiratory rate in CPV infected puppies. Increased respiratory rate could be due to metabolic acidosis, abdominal pain and cardiac ailments induced by CPV infection.

Addition to the above clinical symptoms, petechial haemorrhages were observed in some of the PCR positive puppies. These lesions were observed along the tip of the eyelids (Fig. 1A, B), along the tip line of the lips (Fig 2A, B), around the inguinal region in male puppies (Fig. 3A, B), around perineal region in both male and females (Fig. 4). These lesions were focal as a single and cluster like appearance.

Fig. 1 (A, B): Petechial haemorrhages present around the tip line border of the eyelids in CPV infected puppy.

Fig. 2 (A, B): Petechial haemorrhages present at the tip line border of the lips in CPV infected puppies.

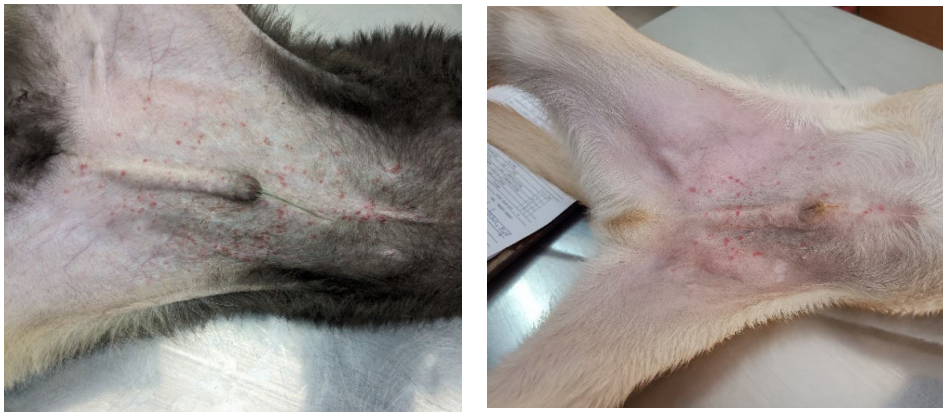

Fig. 4: Picture showing petechial haemorrhages observed at perineal region of a CPV infected puppy.

Fig. 3 (A, B): Petechial hemorrhages observed at inguinal region of CPV infected puppies.

Table 1: Clinical signs observed in study population and PCR positive puppies

Clinical Sign	Study population (n=50)	PCR positive puppies (n=39)
Abdominal Pain	37 (74%)	31 (79.49%)
Anorexia	50 (100%)	39 (100%)
Conjunctival mucus membrane		
Congested	24 (48%)	21 (53.85%)
Slight congested	6 (12%)	6 (15.38%)
Pink	9 (18%)	5 (12.82%)
Pale	11 (22%)	7 (17.95%)
Debility	43 (86%)	36 (92.31%)
Dehydration	39 (78%)	32 (82.05%)
Diarrhoea	49 (98%)	38 (97.44%)
Haemorrhagic	33 (67.35%)	24 (63.16%)
Non-Haemorrhagic	16 (32.65%)	14 (36.84%)
Lethargy	44 (88%)	37 (94.87%)
Mucosal slough in the feces	29 (59.18%)	22 (56.41%)
Oral mucus membrane		
Congested	7 (14%)	6 (15.38%)
Pink	24 (48%)	16 (41.03%)
Pale	18 (36%)	17 (43.59%)
Mild Icteric	1 (2%)	0
Palpable popliteal lymph nodes		
Slight enlarged	7 (14%)	6 (15.38%)
Enlarged	2 (4%)	1 (2.56%)
No abnormality	41 (82%)	32 (82.05%)
Recumbency	13 (26%)	11 (28.21%)
Vomiting	48 (96%)	37 (94.87%)

Table 2: Clinical parameters observed in the PCR positive puppies

Clinical parameter	Healthypuppies	PCR positive puppies
Capillary refill time (seconds)	2±0	2.72±0
Heart rate (per minute)	120±0	125.23±0.68
Rectal temperature (0 F)	101.61±0.07	102.09±0.26
Respiratory rate (per minute)	36.6±2.23	42.43±1.36

In general, in PCR positive puppies petechial haemorrhages were observed along the tip of the eyelids, along the tip line of the lips, around the inguinal region in male puppies, around perineal region in both male and females. These lesions were focal as a single and cluster like appearance.

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