

CLINICAL HAEMATOLOGY IN CANINE HAEMORRHAGIC GASTROENTERITIS

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ABSTRACT

Haemorrhagic gastroenteritis is a common disease of multiple etiology seen in all breed and age groups of dogs. Ten dogs admitted for routine investigation or deworming and vaccination constituted the healthy control. Thirty-one dogs brought leucocytosis where as nine cases showed leucopenia. Neutrophilia with lymphopenia was seen in 36 cases while four cases showed neutropenia with lymphocytosis. The diseased dogs were having marked thrombocytopenia before treatment but the values were restored to almost normal levels within 24 h post treatment. The decreased values of haemoglobin and packed cell volume in haemorrhagic gastroenteritis affected dogs did not increase appreciably after the treatment.

Key words: Haemorrhagic gastroenteritis, haematology

Haemorrhagic gastroenteritis is a common disease of multiple etiology seen in all breed and age groups of dogs. Sudden onset of vomiting, bloody diarrhoea, dehydration, anorexia and depression are the common clinical symptoms. Causative agents responsible for haemorrhagic gastroenteritis are viruses such as Parvo virus (Appel *et al.*, 1978, Hoskins, 1997), Corona virus (Toma and Moraillon, 1980), Rota virus (Barrios *et al.*, 1989), bacterial infections like *Salmonella* spp. (Chaudhary *et al.*, 1985), *Escherichia coli* (Prada *et al.*, 1991), *Clostridium* spp. (Turk *et al.*, 1992), endoparasites such as *Dipylidium caninum*, *Ancylostoma caninum* (Kumar *et al.*, 2001), food allergy (Kumar *et al.*, 2003) and irritant drugs (Waters *et al.*, 1992). The present paper describes the study conducted on 40 dogs having vomiting and bloody diarrhoea of unknown etiology.

MATERIALS AND METHODS

Two millilitre blood from 40 dogs (groups I-IV) having hemorrhagic diarrhea was collected

aseptically in sterile glass vials containing EDTA for haematology before the start of treatment every day. The blood samples from ten healthy untreated dogs (group V) were also collected as described above on the first day of presentation only and was subjected to estimation of haematological values. Haemoglobin, packed cell volume (PCV), total leucocyte count (TLC) and differential leucocyte count (DLC) were estimated by standard procedure as described by Schalm *et al.* (1975) and total platelet count was estimated with the help of MS-9 Cell Counter (Melet Schloesing Laboratories, France). The dogs in group I were treated with Ampicillin and Cloxacillin, group II dogs were given Chloramphenicol while group III dogs with Enrofloxacin and group IV dogs were treated with Metronidazole and Norfloxacin. Statistical analysis was done using Duncans Multiple Range Test as described by Snedecor and Cochran (1968).

RESULTS AND DISCUSSION

Haemoglobin: In the present study the haemoglobin level in healthy control dogs at 0 h ranged between 13.2 to 15.8 g per cent with the mean haemoglobin concentration of 14.22 ± 0.29

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Table 1

Mean haemoglobin and packed cell volume of haemorrhagic gastroenteritis affected (group I-IV) and healthy control (group V) dogs before and after treatment

Group	0 h		48 h		72 h	
	Hb (gm/dl)	PCV (%)	Hb (gm/dl)	PCV (%)	Hb (gm/dl)	PCV (%)
I	9.76 ^b _a ± 0.72	33.70 ^b _a ± 2.05	9.80 ^b _a ± 0.73	36.80 ^b _a ± 2.38	9.84 ^b _a ± 0.71	39.70 ^{ab} _a ± 2.29
II	9.70 ^b _a ± 0.66	32.40 ^b _a ± 2.43	9.70 ^b _a ± 0.59	34.60 ^b _a ± 2.52	9.78 ^b _a ± 0.57	38.00 ^{ab} _a ± 2.56
III	11.40 ^b _a ± 1.09	34.20 ^b _a ± 3.23	11.42 ^b _a ± 1.06	35.40 ^b _a ± 3.11	11.48 ^b _a ± 1.06	37.50 ^b _a ± 2.80
IV	10.10 ^b _a ± 1.39	30.40 ^b _a ± 4.23	10.46 ^b _a ± 1.30	30.00 ^b _a ± 2.44	10.44 ^b _a ± 1.20	35.00 ^b _a ± 3.02
V	14.22 ^a ± 0.29	45.30 ^a ± 1.66	14.22 ^a ± 0.29	45.30 ^a ± 1.66	14.22 ^a ± 0.29	45.30 ^a ± 1.66

Mean values with the same letter in the superscript are not significantly different ($p < 0.05$) among treated groups.

Mean values with the same letter in the subscript are not significantly different ($p < 0.05$) among treatment duration.

g per cent. The normal hemoglobin level in healthy dogs ranges between 12 to 18 g per cent with a mean value of 15 g per cent (Schalm *et al.*, 1975). In haemorrhagic gastroenteritis affected dogs the mean value of haemoglobin at 0 h ranged from 9.70±0.66 to 11.40±1.09 g per cent which was significantly ($P < 0.05$) low as compared to healthy control dogs (Table 1). The haemoglobin values in all treated groups after 72 h of treatment did not show any significant increase. In ten dogs the haemoglobin values were below 8.0 g per cent and it was less than 11 g per cent in 25 dogs out of 40 which were affected with haemorrhagic gastroenteritis. These findings indicate that there was significant decrease in haemoglobin values (except one case) which might be due to loss of blood in vomition and stool. Additionally low haemoglobin values could be due to decreased erythropoiesis as a result of direct effect of parvovirus on the bone marrow (Boosinger *et al.*, 1982) and accumulation of toxic waste products during viremia and febrile phase (Jones and Hunt, 1983) and preexisting poor health status of the dog. Ramprabhu *et al.* (2002) have also reported a decrease in mean haemoglobin value in dogs affected with haemorrhagic gastroenteritis. Following treatment, no significant increase in the haemoglobin concentration was observed.

Packed cell volume: After treatment, there was non significant increase in packed cell volume upto 72 h and the values in all treated groups (I to IV) were increased from 33.70±2.05, 32.40±2.43, 34.20±3.23, 30.40±4.23 to 39.70±2.29, 38.00±2.56, 37.50±2.80,

35.00±3.02 per cent, respectively (Table 1). Packed cell volume in healthy control group dogs at 0 h ranged from 36 to 52 per cent with a mean of 45.30±1.66 per cent while in affected dogs the values were in the range of 18 to 64 per cent with a mean range of 30.40±4.23 to 34.20±2.23 per cent. In the present study majority of the dogs at 0 h affected with haemorrhagic gastroenteritis were having packed cell volume values less than 45 per cent (Table 1). Biswas *et al.* (2005) have also reported a decrease in PCV values in the parvo virus affected dogs. In contrast Burrows (1977) reported that elevated packed cell volume secondary to fluid loss is the most consistent finding in acute haemorrhagic gastroenteritis.

In majority of the cases admitted during the period from October to February affected with haemorrhagic gastroenteritis, the degree of dehydration as a result of vomition and diarrhoea was mild while it was recorded as moderate (7-10 per cent) in four cases, which were admitted during the month of March to May, indicating that weather also influences the status of dehydration in these dogs. In majority of the dogs in the present investigation, the packed cell volume values were low. O'Sullivan *et al.* (1984) have reported an initial increase in packed cell volume with the onset of vomition and diarrhoea which subsequently decreases to below normal values with the progression of the diseases. In the present study, after 72 h of treatment, 26 out of 40 dogs showed slight increase in mean packed cell volume values indicating that there was activation of the physiological system of

affected dogs.

Total leucocyte count: The total leucocyte count at 0 h ranged from 8.4 to $14.2 \times 10^3/\mu\text{l}$ with a mean of $9.83 \pm 0.52 \times 10^3/\mu\text{l}$ in healthy dogs. The total leucocyte count values in affected dogs at 0 h ranged from 2.0 to $49.2 \times 10^3/\mu\text{l}$ with a mean range of 29.55 ± 2.73 to $34.27 \pm 2.28 \times 10^3/\mu\text{l}$ (Table 2). There was significant decrease in total leucocyte count values after 72 h of treatment and the values recorded were 13.85 ± 1.07 , 16.14 ± 0.98 , 20.50 ± 1.06 and 14.34 ± 0.85 per cent in groups I to IV, respectively. The total leucocyte count values in nine dogs affected with haemorrhagic gastroenteritis were in the range of 2.0 to $7.6 \times 10^3/\mu\text{l}$ while it ranged from 22.0 to $49.2 \times 10^3/\mu\text{l}$ in rest of the dogs. A moderate to severe fall in the total leucocyte count in dogs suffering from canine parvoviral infection has been reported by several workers (Appel *et al.*, 1978, Greene, 1984, Macartney *et al.*, 1984). It has been reported by Macartney *et al.* (1984) that viral replication in rapidly multiplying bone marrow and lymphatic tissue may destroy the actively mitotic myeloid precursors and lymphoid cell resulting in a state of leucopenia. In the present study nine dogs were showing mild to moderate leucopenia which could be due to viral infection. Leucocytosis was recorded in 31 cases which might be due to primary or secondary bacterial infection, acute intravascular haemolysis with the damage to the tissues of liver and other organs or from secondary resurgence of the bone marrow leading to increased production of cells with a shift of the cells from the marginal pool to

the circulating pool. These findings are in conformity with the results of Greene, (1984).

Platelets: The total platelet counts of control group dogs at 0 h ranged from 452 to $516 \times 10^3/\mu\text{l}$ with a mean of $481.50 \pm 9.09 \times 10^3/\mu\text{l}$. In all affected dogs the values ranged from 41.50 ± 6.78 to $51.00 \pm 8.19 \times 10^3/\mu\text{l}$ which were significantly lower than the healthy control group (Table 2). These values present a clear picture of thrombocytopenia which could be due to loss of blood through vomitus and faeces, increased destruction and/or aggregation, decreased production and disseminating intravascular coagulation. In addition to these factors, erratic sampling leading to formation of blood clot at the time of collection also causes lowering of platelet values. Otto *et al.*, (2000) have also reported that dogs with canine parvoviral enteritis have a high prevalence of clinical thrombosis or phlebitis. In the present study, the platelet values increased sharply after 48 h of treatment and were in the range 61.80 to $91.20 \times 10^3/\mu\text{l}$. In all the four treated groups there was significant increase in mean platelet count which increased to 197.90 ± 13.25 , 143.50 ± 8.93 , 106.70 ± 12.38 , and 149.90 ± 12.26 after 72 h of treatment, respectively.

Differential leucocyte count: In healthy dogs, the neutrophils ranged from 66 to 74 per cent with a mean value of 69.8 ± 0.80 per cent, whereas in haemorrhagic gastroenteritis affected dog the values ranged from 71.50 ± 6.73 to 83.60 ± 2.82 per cent. After 72 h of treatment, neutrophil numbers decreased significantly from 81.30 ± 6.15 , 83.60 ± 2.82 to 70.10 ± 2.06 ,

Table 2

Mean total leucocyte count (TLC) and platelets count of haemorrhagic gastroenteritis affected (group I-IV) and healthy control (group V) dogs before and after treatment

Group	0 h		48 h		72 h	
	TLC ($(10^3/\mu\text{l})$)	Mean platelet count ($10^3/\mu\text{l}$)	TLC ($(10^3/\mu\text{l})$)	Mean platelet count ($10^3/\mu\text{l}$)	TLC ($(10^3/\mu\text{l})$)	Mean platelet count ($10^3/\mu\text{l}$)
I	$29.74^a \pm 2.60$	$46.70^b_c \pm 7.94$	$23.91^b_b \pm 1.87$	$91.20^b_b \pm 9.06$	$13.85^b_c \pm 1.07$	$197.90^b_a \pm 13.25$
II	$30.77^a \pm 2.71$	$41.50^b_c \pm 6.78$	$25.77^{ab}_b \pm 2.05$	$79.70^b_b \pm 6.16$	$16.14^b_b \pm 0.98$	$143.50^b_a \pm 8.93$
III	$34.27^a \pm 2.28$	$50.30^b_b \pm 8.33$	$30.29^a_a \pm 1.93$	$61.80^b_b \pm 9.87$	$20.50^b_b \pm 1.06$	$106.70^d_a \pm 12.38$
IV	$29.55^a \pm 2.73$	$51.00^b_c \pm 8.19$	$22.52^b_b \pm 2.42$	$87.60^b_b \pm 9.55$	$14.34^b_a \pm 0.85$	$149.90^c_a \pm 12.26$
V	$9.83^b \pm 0.52$	$481.50^a \pm 9.09$	$9.83^b \pm 0.52$	$481.50^a \pm 9.09$	$9.83^b \pm 0.52$	$481.50^a \pm 9.09$

Mean values with the same letter in the superscript are not significantly different ($p < 0.05$) among treated groups. Mean values with the same letter in the subscript are not significantly different ($p < 0.05$) among treatment duration.

78.40±1.70 per cent in groups I and II, respectively. In groups III and IV decrease in neutrophil values was not statistically significant. The lymphocyte values in healthy dogs ranged from 18 to 24 per cent with a mean value of 21.40±0.87 per cent. In haemorrhagic gastroenteritis affected dogs the values ranged from 14.30±2.05 to 25.80±6.47 per cent. After 72 h of treatment, the values of lymphocytes in group I and II increased significantly from 14.90±4.77 and 14.30±2.05 to 25.40±1.21 and 19.60±1.38 per cent, respectively.

Neutrophilia and lymphopenia observed in 36 cases affected with haemorrhagic gastroenteritis in the present study could be due to severe inflammatory reaction caused by bacterial infections. This is in agreement with the findings of Macartney *et al.* (1984) and Ramprabhu *et al.* (2002). Haematological finding showed a marked decrease in haemoglobin, packed cell volume and platelet values in haemorrhagic gastroenteritis affected dogs. Majority of the dogs showed leucocytosis probably due to primary/secondary bacterial infections where as few cases showed leucopenia. These values could increase appreciably 72 h after treatment.

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