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Changes of Haematobiochemical Parameters during Canine Parvoviral Enteritis

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Abstract

Canine parvovirus is a highly contagious virus that can affect all dogs, but unvaccinated dogs and puppies younger than four months old are the most at risk. The pathology caused by CPV-2 is very common in Albania despite the existence of an effective vaccine.Changes in haematobiochemical parameters during canine parvoviral enteritiswould be very important for determining the prognosis of the disease. This hypothesis prompted the start of the study. From fecal samples taken from puppies 65 individuals resulted positive. Of all individuals 14 of them (21.5%) failed to survive. All puppies presented leukopenia. In individuals that survived the WBC count began to grow in the first 24-48 hours ($p < 0.05$). In non-survivors the WBC was never higher than $2.1x10^9$ / l at the time of admission in the clinic and in the first 24-48 hours began to decline further ($p < 0.05$). There weren't significant change in RBC count ($p < 0.05$). In the first 12-24 hours 54% of individuals who did not survive had a PLT count less than $362.28x10^9$ / l compared to only 8% of individuals who survived. Urea and creatinine were higher in survivors compared to non-survivors ($p < 0.05$).These parameters reached normal levels after the start of the treatment in individuals that survived. Urea and creatinine levels in non-survivors continued to decrease until they died. The changes observed in leukocyte, platelet, urea and serum creatinine levels duringfirst stages of canine parvoviral enteritiscan be used to determine prognosis.

Keywords: companion animals,canine parvovirus, haematobiochemical changes, prognosis.

1. Introduction

Canine parvovirus is a highly contagious virus that can affect all dogs, but unvaccinated dogs and puppies younger than four months old are the most at risk. The first case with enteritis and myocarditis caused by a parvovirus (CPV-2) were diagnosed in the United States in 1978. Since then, CPV-2 infection had spread rapidly throughout the world.Initial outbreaks of parvovirus in dogs were characterized by high morbidity and mortality in all puppies younger than 6 month [7, 13].The pathology caused by CPV-2 is very common in Albania despite the existence of an effective vaccine.The clinical manifestations of CPV infection depends on age, immune status of the animal, the virulence of the virus, the infectious dose of virus and previous existence of parasites, bacteria and other viral infections [4, 6]. CPV-2 infects and replicates in rapidly dividing cells especially in lymph nodes in myeloid cells in red bone marrow and intestinal epithelial cells [3].Replication results in the destruction of cells causing clinical pathologyleading to vomiting, hemorrhagic diarrhea, dehydration and neutropenia [4, 9].It is also reported that breeds Doberman pinscher, Rottweiler and German shepherd are more vulnerable than other breeds [5]. Most of the adult dogs have become immune by vaccination or by a previous infestation.Although the treatment of dogs with parvoviral enteritis is proving increasingly successful, many dogs die because of CPV-2 related complications or euthanized because of the high cost of medication [1, 2, 8, 14, 15].Mortality ratesvary between 4 and 40 per cent [11].

Changes in haematobiochemical parameters during canine parvovirosis would be very important and necessary for determining the prognosis of the disease. This hypothesis prompted the start of the study

2. Material and Methods

Rapid tests were used to diagnose puppies affected by CPV-2.(VIRBAC immunchromato-graphic test kit). 65 puppies with acute parvoviral gastroenteritis had positive outcome in tests

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performed.Criteria for individuals included in the study:

- different breed and sex
- ages 6 weeks - 24 weeks
- the presence of clinical signs of gastroenteritis (anorexia, vomiting, hemorrhagic diarrhea, dehydration).
- negative result for the presence of Giardia
- Without clinical signs of Canine Distemper Virus (muco-purulent ocular-nasal discharge, neurological signs).

Blood samples were taken at the time of presentation to the clinic, then every 12 hours and in the following days every 24 hours until recovery or death. Blood samples were taken cephalic vein, or jugular and put in containers with EDTA. Each of the samples were sent to the laboratory where subjected to analysis to observe haematobiochemical changes. All dogs of diagnosed with parvoviral enteritis are treated with supportive therapy during hospitalization (rehydration therapy, antiemetics, antibiotics, etc.)

3. Results and Discussion

Parvovirus remains a significant cause of morbidity and mortality in dogs. Despite the existence of an effective vaccine against parvoviral enteritisthe only treatment is supportive therapy. The survival rate of infected dogs with parvoviral enteritis without treatment with supportive therapy is 9.1%, but the survival rate of clinically affected dogs treated with supportive therapy is 64-79% [9]. Intensive therapy affects the survival of animals, however it is usually very costly. This study tried to show the possibility of setting the prognosis in the first stages of the pathologybased on the haematobiochimicalchanges, thus creating the possibility of avoiding high costs.

Table 1. Puppies affected by CPV-2.

Breed		Sex				Age (weeks)			
		Male		Female		6-12		13-24	
	Nr	S	NS	S	NS	S	NS	S	NS
Mix	16	5	2	6	3	8	3	2	2
Doberman pinscher	4	2	-	1	1	2	1	1	-
Illyrian sheepdog	3	2	-	1	-	3	-	-	-
Rottweiler	7	2	2	2	1	3	2	1	1
Husky	5	2	-	3	-	3	-	2	-
Pit bull	4	3	-	1	-	2	-	2	-
Labrador	5	2	-	2	1	1	1	3	-
Poodle	1	1	-	-	-	1	-	-	-
Shih tzu	2	1	-	1	-	2	-	-	-
German shepherd	3	2	1	-	-	1	1	1	-
Terrier	5	1	-	3	1	3	1	1	-
Cocker spaniel	1	-	-	1	-	-	-	1	-
Dogo Arg.	1	1	-	-	-	-	-	1	-
Spitz	5	1	2	2	-	3	2	-	-
Maltese	1	-	-	1	-	1	-	-	-
Pekingese	2	1	-	1	-	1	-	1	-

*****_S – Survivor_
NS – Non-survivor

From fecal samples taken from puppies who showed signs of gastroenteritis resulted positive 65 individuals of which 37 males (56.9%) and 28 women (43.1%). Of all individuals 14 of them (21.5%) failed to survive.There were no statistically differences in terms of sex ($p < 0.05$) between individuals that survived and those who did not survive. Higher mortality was observed in the younger age. Of the 14 individuals who did not survive 11 were the age group of 6-12 weeks (78.6% of individuals who did not survive or 16.9% of total individuals under study) and 3 of them were the age group 13 to 24 weeks (21.4% of the individuals who did not survive or 4.6% of total individuals under study).

Of the 65 individuals under study 52 cases (80%) were submitted to the clinic on the second, third and fourth day of the onset of symptoms (Table 3).

Table 2. Haematological parameters of the infected puppies, at the day of admission.

	Normal parameters	Parameters S	Parameters NS
WBC	5.0–14.1 ($x10^9$/L)	7,16±1,50	2,10±1,14
Lymph	0.4–2.9 ($x10^9$/L)	2,38±0,47	0,66±0,14
Mono	0.1–1.4 ($x10^9$/L)	0,36±0,09	0,12±0,06
Gran	2.9–12.0 $x10^9$/L)	4.96±1.12	1.62±0.88
RBC	5.0–7.9 $x10^{12}$/L)	5,71±0,18	4,96±0,42
HGB	12.0–19.0 (g/L)	10,20±0,51	10,73±0,42
HCT	35.0–57.0 (%)	30,48±1,37	33,63±2,41
PLT	211.0–621.0 $x10^9$/L)	422.12±55,61	362.28±24,14
MCV	66.0 –77.0 (fL)	60,92±1,23	59,50±1,07
MCHC	32.0–36.3 (g/dL)	33,57±0,46	32,55±0,82

***S – Survivor*
NS – Non-survivor

Data from the study showed that there were a high percentage of individuals with leukopenia. There was also a significant difference between individuals that survived and those who did survived (Figure 1).

Table 3. Biochemical parameters of the infected puppies, at the day of admission

Normal parameters	Parameters S	Parameters NS
Creatinine 0.5–1.7 (mg/dL)	0,20±0,03	0,87±0,13
Urea 8.0–28.0 (mg/dl)	32,15±4,43	63,25±12,9
Total protein 5.4–7.5 (g/dL)	3,92±0,24	3,61±0,27
Albumin 2.3–3.1 (g/dL)	2.10±0.22	2.24±0.22
Bilirubin 0–0.3 (mg/dL)	0.62±0.34	0.71±0.28
ALT 10–109 (IU/L)	68.62±13.96	70.18±11.82
AST 5–55 (IU/L)	88.98±9.04	90.16±10.32

***S – Survivor*
NS – Non-survivor

In individuals that survived the total number of leukocytes began to grow in the first 24-48 hours ($p < 0.05$). In individuals who did not survive the total number of leukocytes was never higher than $2.1x10^9$ / l at the time of admission in the clinic and in the first 24-48 hours began to decline further ($p < 0.05$). The most significant differences between individuals survive and those that did not survive was in the first 24-48 hours.According to these data we can say that, in 24-48 hours before we are able to give a prognosis of the pathology based on changes in leukocyte formula. If the total number of leukocytes remains less than $2.0x10^9$ / l, in the first 24-48 hours chances

of survival are very small. In fact the results obtained revealed that the total number of leukocytes in these individuals just drop by the day.

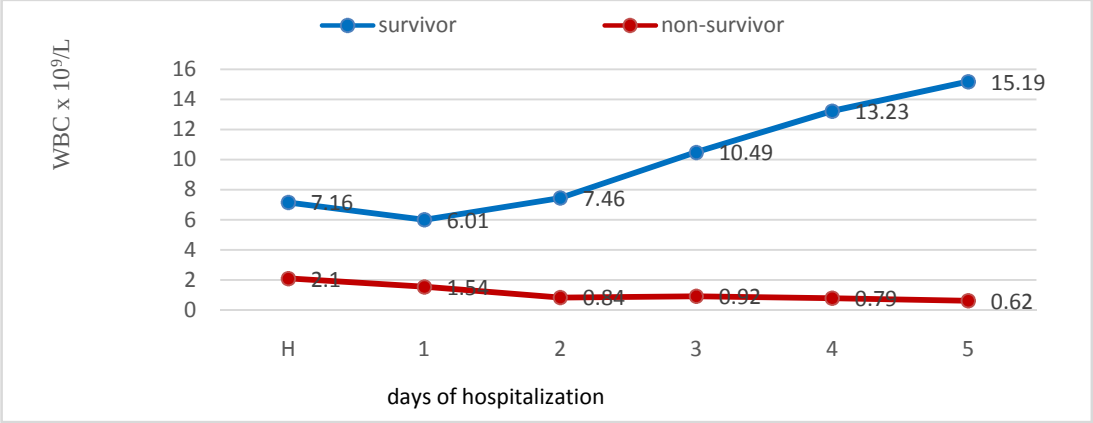

Figure 1. Leukocyte kinetics during hospitalisation

During the course of the disease was not observed any significant change in red blood cell parameters (p <0.05) (Figure 2). Even when the anemia was observed it was in the moment of admission and its level had not changed. During days of treatment was observed a decrease in hematocrit, which is a result ofintestinalhemorrhage and diluting effect of rehydration therapy used [4]. In general anemia during canine parvoviral enteritisisrare. This happens because the mature red blood cells have a long life span in circulationrelative to the short period the virus suppresses production in the bone marrow[10]. Based on these data we can say that changes in red blood cell parameters cannot be used to determine a prognosis for this pathology.

Thrombocytopenia is observed very often during viral infections. In this study were observed significant differences in platelet count in individuals who survived and those who did not survive (Figure 3). In the first 12-24 hours 54% of individuals who did not survive had a plateletcount less than $362.28x10^9$ / l compared to only 8% of individuals who survived. These findings correlate with those seen inthe leukocytes and can therefore serve as a contributing parameter in determiningprognosis [3].

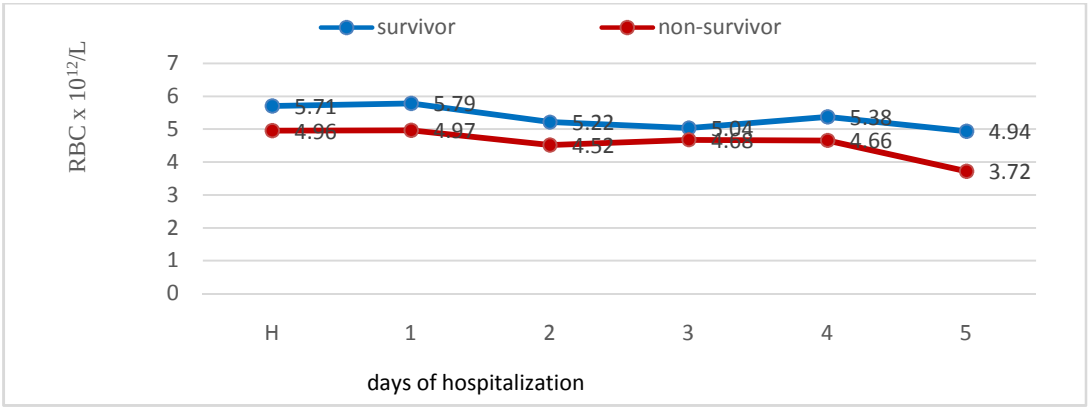

Figure 2. Erytrocite kinetics during hospitalisation

Urea and creatinine were higher in individuals who did not survive compared to those who survived (p <0.05). These parameters reached normal levels after the start of the treatment in individuals that survived, something which was not observed in individuals that did not survive.Urea and creatinine levels in non-survivors continued to decrease until they died.

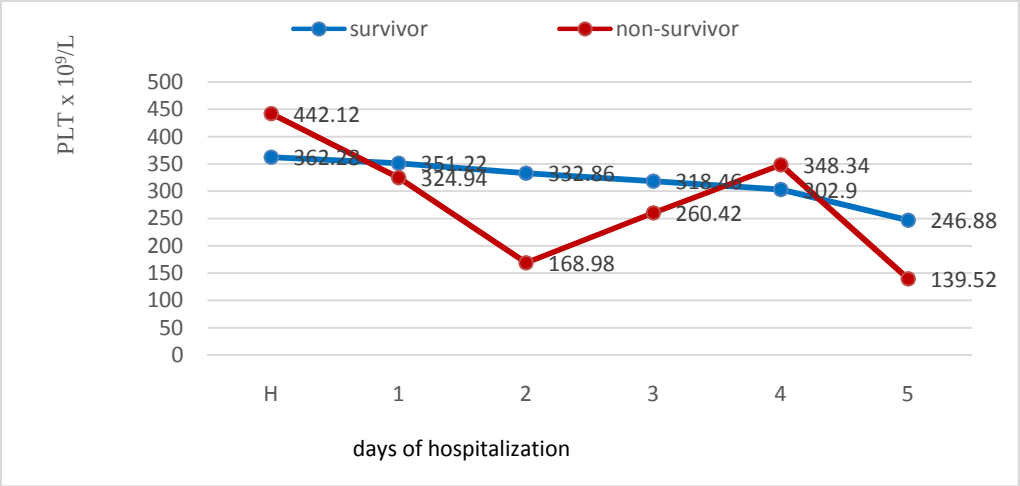

Figure 3. Thrombocyte kinetics during hospitalisation

The changes in blood formula are related with the fact that the virus affects bonemarrow and is cytotoxic for hematopoietic cellsleading to myeloid and erythroid hypoplasia duringacute stages of the disease[12]. This process results in a low level of production of leukocytes regardless of body mass needed for these cells. Thrombocytopenia is another consequence of e canine parvoviral enteritis.This results in bleeding and even damage of vascular permeability, leading to extravascular spreading virus. Reduction of plasma proteins is due to intestinal hemorrhage followed by rehydration. Increased AST and ALT level is a result of hepatic hypoxia (an effect related to the general hypovolemia) and absorption due to toxic substances.

Increased urea and creatinine level is closely related to dehydration.

4. Conclusions

Canine parvoviral enteritis is a very frequent disease in Albania. Determining the prognosis in early stages of disease a lot of benefits including the economic impact because as it is known the treatment of this pathology has a significant cost. The changes observed in blood formula in individuals who survived and those who did not survive duringcanine parvoviral enteritis can accurately determine prognosis based on changes in leukocyte and platelet count over the course of the disease. The level of urea and serum creatinine can be used also in determining the prognosis.These changes are not always pathognomonic for a specific pathology in our case are a very big help in determining prognosis in early stages of disease.

5. References

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