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OPEN ACCESS JOURNAL ISSN: 2148-6832

MSD Medical Science and Discovery
2019; 6(2):24-6

Research Article Doi: 10.17546/msd.522081

Determination of platelet count and platelet indices in Canine Parvoviral Enteritit

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Abstract

Objective: Canine parvoviruses (CPV) are DNA viruses with symptoms that can cause death in young dogs. The aim of this study was to characterize platelet count and platelet indices at the time of diagnosis of CPV and to assess the correlation between PLT, RBC, and WBC with platelet indices.

Materials and Methods: The current study included 26 dogs with Parvo and 11 healthy dogs.

Results: When the haemogram values were compared statistically, no difference was observed. Positive correlation was found between Mean platelet volume (MPV) and Platelet distribution width (PDW).

Conclusions: Platelet and platelet indices may not be important in the diagnosis and prognosis of CPV. Further studies on this issue are of importance in terms of understanding the PLT indices in viral disease in animals.

Keywords: Canine Parvovirus, platelet, mean platelet volume, platelet distribution width, plateletcrit

Introduction

Parvoviruses can cause disease in many animal species and humans. Canine parvoviruses (CPV) are non-enveloped, single-stranded DNA viruses that are known to cause morbidity and mortality in young dogs (1). CPV endotoxin and tumor necrosis factor (TNF) are present in measurable quantities in the blood of infected puppies and in addition significant association between increased TNF activity and mortality. Endotoxin and proinflammatory cytokines are potent mediators of the systemic inflammatory response (1).

The complete blood count (CBC) is one of the most common laboratory tests performed in both human and veterinary medicine. By this test different kind of cells can be evaluated easily. Platelets are the cells with the highest cell population after erythrocytes and their role is to protect against bleeding (2-3). Thrombocytopenia is one of the complications of viral infections and has a very important role in the pathogenesis of endotoxemia (3-5).

With the help of developing blood cell analyzers in recent years, it is possible to obtain more information about platelets through the measurement of platelet indices (5-6).

Mean platelet volume (MPV) is the average platelet size. Platelet distribution width (PDW) is the variability in the size of the platelet and plateletcrit (PCT) is the percentage of the blood volume that consists of platelets (7-8).

Platelet indices have prognostic significance in septic animals and humans such as increased MPV and PDW together with decreased PCT associated with increased morbidity and mortality (8). However, to the authors' knowledge, there is no report about the predictive value or usefulness of platelet and its indices in CPV.

The aim of this study was to elucidate the usefulness of platelet count and platelet indices (MPV, PDW, and PCT) in canine parvovirus. We also aimed to examine the association between PLT, MPV, PDV, PCT, RBC and WBC.

Received 04-02-2019 **Accepted** 26-02-2019 **Available Online** 26-02-2019 **Published** 28-02-2019
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Materials and Methods

The electronic medical record database was searched for cases of CPV. 26 dogs with Parvo and 11 healthy dogs were enrolled into the study, retrospectively. Dog breeds with congenital macrothrombocytopenia (eg, Cavalier King Charles, Cairn Terriers, and Norfolk Terriers) and Greyhounds due to their physiologically decreased PLT were excluded from the study. Dogs receiving any treatment before the CBC were excluded. All animals data including age, sex, breed were recorded. The dogs were healthy based on normal physical examinations and blood tests. Dogs with a history of vomitting and haemorrhagic diarrhea and positive snap Parvo antigen test (Antigen Rapid CPV Kit, Animal genetics, Inc., Korea) from faecal samples were diagnosed CPV.

Venous blood samples were withdrawn from the jugular, cephalic or lateral saphenous vein into K3EDTA-coated polypropylene tubes. Samples were analyzed after the blood collection using the automatic haematology analyser (Mindray BC-2800 Vet (Shenzen, China) hematology analyzer). Total red blood cells (RBC), white blood cells (WBC), hematocrit (PCV), hemoglobin (Hb), mean cell volume (MCV), mean cell hemoglobin (MCH), mean cell hemoglobin concentration (MCHC), platelet (PLT), mean platelet volume (MPV), platelet distribution width (PDW), and plateletcrit (PCT) were analyzed.

Snap CPV antigen test was performed following the manufacturer's instruction. All blood tests were performed before the treatment in each animal.

Statistical analysis

Analysis between groups were evaluated by an independent samples t-test. Data were expressed as mean standard deviation. Relationship between parameters were determined by Pearson corelation test (SPSS 10.0 Statistical Program, SPSS Inc. Chicago, IL, USA).

Results

There was a variety of breeds presented in the study. 14 of them were mix-breeds, 6 were Kangal, 2 were West Highland Terrier, 2 were German Sephard, 1 were Rottweiler and 1 was Husky in dogs with CPV. In the healthy dogs; 4 of them are mix-breeds, 4 are West Highland Terriers, 2 are Golden Retrievers, 1 is Kangal. 18 of the dogs with CPV and 7 of the healthy dogs were male. The median age was 10-mounths (3 mounths-3 years) in dogs with CPV, and 6 years-old (7 mounths-13 yeats-old).

No statistical significance was found between the groups for mean Platelet (PLT) count, MPV, PDW, and PCT (Table 1). Only PDW correlated positively with MPV (P<0,001) (Table 2).

Table 1. Complete blood count (CBC) and Platelets, Trombosit (PLT) indices in dogs with Canine parvoviruses and healthy dogs.

	Dogs with Parvo Mean±SD	Healthy Dogs Mean±SD	Normal Values Mean±SD
RBC (10^6/mm^3)	5,9±0,2	6,1±0,4	5,65-8,87
HCT (%)	35,3±1,6	37,9±2,6	37,3-61,7
HGB (g/dl)	12,3±0,6	13,5±1	13,1-20,5
MCV (µm^3)	59,8±0,7	62,4±1,3	61,6-73,5
MCH (pg)	20,8±0,2	22,1±0,4	21,2-25,9
MCHC (g/dl)	34,3±0,7	35,5±0,6	32-37,9
WBC (10^9/l)	9,4±1	12,2±1	5,05-16,76
PLT (10^9/l)	461,1±34,2	358,3±40,2	148-484
MPV (10^{15}/l)	9,8±0,2	10,5±0,3	8,7-13,2
PDW (10^{15}/l)	12,6±0,4	12,5±0,7	9,1-19,4
PCT (µg/l)	0,4±0,02	0,4±0,03	0,14-0,46

Table 2. Correlation of blood parameters (RBC, WBC, MPV, PDW) and mean platelet volume (MPV), platelet distribution width (PDW), and plateletcrit (PCT)

	RBC	WBC	MPV	PDW
MPV	-0,012	0,249	-	-
PDW	-0,153	0,101	0,676***	-
PCT	-0,022	-0,049	-0,284	-0,091

*** P<0,001

Discussion

The effects of viruses on platelets are multifactorial and vary between different kinds of virus infections (2-3). Platelets can interfere with inflammatory responses via their receptors and intracellular glycoproteins (3). Direct action of viruses and/or immunologic components on platelets can cause decreased PLT production and then thrombocytopenia (1). Viruses can bind to specific platelet binding sites and induce platelet aggregation and release (4). However unlike the other studies with different kind of viruses, the PLT count and PLT indices were within normal values in all animals with CPV in our study. This data shows that PLT and PLT indices may not have an important role in CPV.

PLT indices were the markers of platelet activation in humans and animals. It is controversial whether there is a statistical significance between PLT and PLT indices espicially with MPV in dogs. MPV is an important marker of thrombopoiesis and platelet function (7). But PDW is a more reliable marker in the determination of macroplatelet increase compared to MPV (9). In a study of Yılmaz et al. (5) with dogs, it was concluded that PLT correlated positively with PCT, however negatively with MPV and PDW. Similar to this study, Bomer et al. found an inverse relationship between PLT and PDW in an article in 2008. Similar to Evans and Smith's work (6), we did not find any significant relationship between PLT and other parameters in our study. However, there was a positive correlation between PDW and MPV which is similar to the work done by Bommer et al. (9). This may be due to the increased platelet heterogeneity via increased amount of large PLT.

Anemia is a common hematological finding of the later phases of severe disease (1). Only seven of the patients had anemia in our study. Although it was not statistically significant, hematocrit counts were below the normal limits in our study. Reduced hematocrit is more likely to be the result of a combination of intestinal hemorrhage and rehydration therapy (1). All blood samples in our study were taken before the treatment, therefore, this decrease was thought to be caused by intestinal bleeding.

The retrospective nature of this study does not allow confirmation with peripheral blood smears. This is important to split the reasons of trombocytopenia like platelet aggregates or clumps. In our study, it was decided that it was insignificant to make this confirmation because none of the patients had thrombocytopenia.

Conclusion

PLT and PLT indices are used to diagnose many diseases and to determine prognosis in human medicine. However there is still limited information in the veterinary literature about their clinical utility. Further studies are warrented to fully understand the role of PLT in viral infections. In addition this studies will close the gap on this issue and help us to predict the prognosis.

Acknowledgement: None

Conflict of Interest: The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Author's Contributions: LK: Research concept and design; data collecting, analysis and interpretation of data. **LK:** Preparation of article, and Revisions. All authors approved the final version of the manuscript.

Ethical issues: All Authors declare, Originality and ethical approval of research. Responsibilities of research, responsibilities against local ethics commission are under the Authors responsibilities.

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