

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; 10(6): 496-498
www.biochemjournal.com
Received: 15-04-2026
Accepted: 18-05-2026

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Clinical management of severe leukopenia in canine parvoviral enteritis using Filgrastim in five dogs: A case series

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i6f.8672>

Abstract

Canine parvoviral enteritis is an acute and highly contagious viral disease that primarily affects young dogs and is characterized by severe gastrointestinal disturbances and immunosuppression. Leukopenia is one of the most important haematological abnormalities observed in infected animals and significantly increases the risk of secondary bacterial infections. The present case series describes the clinical management of five dogs diagnosed with canine parvoviral enteritis accompanied by severe leukopenia. All animals presented with vomiting, haemorrhagic diarrhea, anorexia, dehydration, and depression. Haematological examination revealed markedly reduced leukocyte counts ranging from 900 to 1500 cells/ μ L. Molecular confirmation of infection was achieved using PCR targeting the VP2 gene of canine parvovirus. The dogs were treated with Filgrastim at a dose rate of 10 μ g/kg body weight along with intensive supportive therapy including intravenous fluids, antimicrobial agents, antiemetics, and gastric protectants. Leukocyte counts increased significantly within 24-48 hours following Filgrastim administration and all dogs recovered completely within five days of treatment. These findings indicate that Filgrastim may serve as an effective adjunct therapy for the management of severe leukopenia associated with canine parvoviral enteritis.

Keywords: Canine parvovirus, leukopenia, Filgrastim, PCR, dogs

Introduction

Canine parvovirus infection is one of the most significant viral diseases affecting domestic dogs worldwide, particularly puppies between six weeks and six months of age (Greene, 1984; Decaro and Buonavoglia, 2020) [6, 4]. The virus replicates in rapidly dividing cells including intestinal crypt epithelium, lymphoid tissues and bone marrow, leading to severe intestinal damage and immunosuppression (Greene and Decaro, 2012) [7].

Clinical signs commonly include vomiting, hemorrhagic diarrhea, dehydration, anorexia and depression. Hematologically, infected animals frequently exhibit leukopenia due to destruction of bone marrow precursor cells and reduced neutrophil production (Glickman *et al.*, 1985) [5]. Severe leukopenia compromises immune defense and increases susceptibility to secondary bacterial infections.

Treatment of canine parvoviral enteritis primarily involves intensive supportive care including fluid therapy, antibiotics and antiemetics. Recently, granulocyte colony-stimulating factors such as Filgrastim have been investigated as supportive therapeutic agents because they stimulate neutrophil production and accelerate recovery from leukopenia (Novotny *et al.*, 1995; Areshkumar *et al.*, 2017) [10, 1].

Materials and Methods Case Selection

Five puppies aged between 2 and 3.5 months were presented to the veterinary clinical facility with clinical signs suggestive of canine parvoviral enteritis, including vomiting, hemorrhagic diarrhea, anorexia, and dehydration.

Table 1: Clinical characteristics of puppies affected with canine parvoviral enteritis included in the present case series.

Case	Breed	Age (months)	Sex	Body Weight (kg)	Major Clinical Signs	Outcome
Dog 1	Labrador Retriever	2.5	Male	4.8	Vomiting, hemorrhagic diarrhea, dehydration, anorexia	Recovered
Dog 2	German Shepherd	3.0	Female	5.9	Vomiting, lethargy, bloody diarrhea	Recovered
Dog 3	Mixed Breed	2.0	Male	4.3	Severe diarrhea, depression, dehydration	Recovered
Dog 4	Rottweiler	3.5	Male	6.2	Vomiting, hemorrhagic diarrhea, weakness	Recovered
Dog 5	Labrador Retriever	2.8	Female	5.4	Vomiting, anorexia, diarrhea	Recovered

Clinical examination

Clinical examination was performed and the following parameters were recorded:

- Rectal temperature
- Heart rate
- Capillary refill time
- Hydration status
- Mucous membrane color

All animals showed moderate dehydration and depression at the time of presentation.

**Fig 1:** Clinical appearance of dogs affected with canine parvoviral enteritis

Blood sample collection

Blood samples were collected aseptically from the cephalic vein. EDTA blood samples were used for hematological examination while serum samples were used for biochemical analysis.

Hematological Parameters of CPV-Affected Dogs

Table 2: Hematological parameters observed in five dogs affected with canine parvoviral enteritis before and after Filgrastim therapy.

Parameter	Dog 1	Dog 2	Dog 3	Dog 4	Dog 5	Normal Range
Hemoglobin (g/dL)	9.1	8.4	7.6	9.8	8.7	12-18
PCV (%)	29.5	27.2	24.8	31.4	28.6	37-55
RBC (million/mm ³)	4.2	3.8	3.4	4.6	3.9	5.5-8.5
WBC Day 1 (cells/ μ L)	1000	1200	900	1500	1100	6000-17000
WBC Day 2 (cells/ μ L)	5800	6100	5500	7200	6000	6000-17000
WBC Day 3 (cells/ μ L)	7800	8200	7600	8900	8000	6000-17000
Platelets (lakhs/ μ L)	3.6	3.4	3.1	3.8	3.5	2-5

PCR Detection of Canine Parvovirus

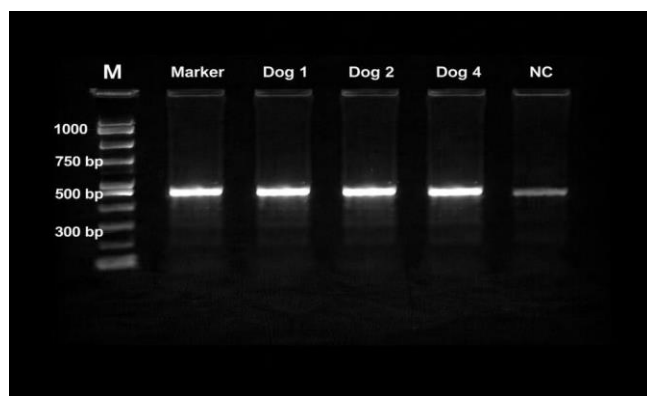
Fecal samples were collected and subjected to PCR for detection of canine parvovirus DNA. Viral DNA was extracted using standard protocols and PCR amplification

targeted the VP2 gene, which is commonly used for detection and molecular characterization of canine parvovirus (Buonavoglia *et al.*, 2001; Miranda and Thompson, 2019).

Forward primer: 5'-CAGGTGATGAATTTGCTACA-3'

Reverse primer: 5'-CATTTGGATAAACTGGTGGT-3'

PCR amplification produced a **630 bp fragment** confirming canine parvovirus infection.

**Fig 2:** Illustrative image of PCR amplification of VP2 gene showing 630 bp band

Sequence similarity analysis was performed using the BLAST algorithm available in the NCBI database (Altschul *et al.*, 1997) [2].

Treatment Protocol

All dogs were treated using a standardized therapeutic regimen. Filgrastim was administered subcutaneously at **10 μ g/kg** body weight once daily.

Drug protocol

Drug	Dose	Route	Frequency
Lactated Ringer's Solution	10 ml/kg	IV	BID
Dextrose 5%	10 ml/kg	IV	BID
Ceftriaxone	25-30 mg/kg	IV/IM	BID
Amikacin	5-10 mg/kg	IM	SID
Metronidazole	25 mg/kg	IV	BID
Ondansetron	0.1 mg/kg	IV	BID
Ranitidine	2 mg/kg	IV	BID

Results and Discussion

Initial hematological evaluation revealed severe leukopenia in all five dogs with leukocyte counts between 900-1500 cells/ μ L. After administration of Filgrastim, leukocyte counts increased significantly within 24-48 hours and approached normal values by the third day of therapy.

Clinical signs gradually improved during treatment. Vomiting and diarrhea subsided within two days and appetite returned progressively. All dogs recovered completely within five days of treatment.

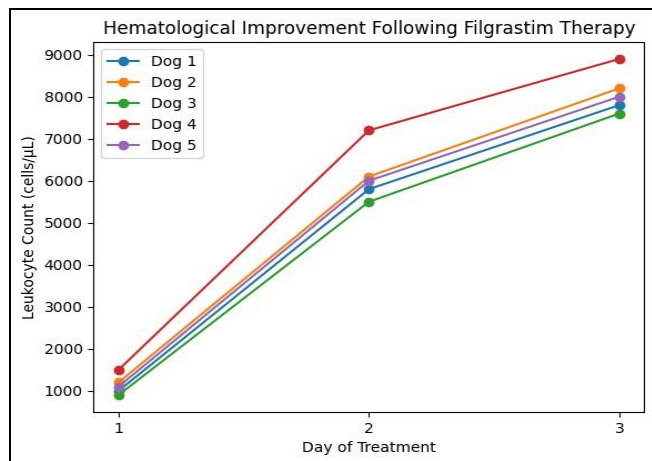


Fig 3: Hematological improvement following Filgrastim therapy

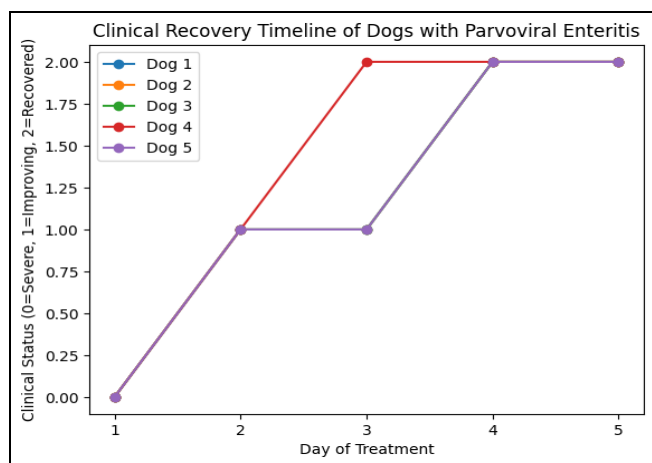


Fig 4: Clinical recovery timeline of affected dogs

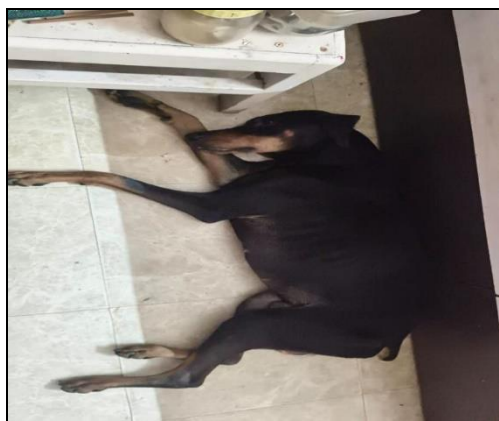


Fig 5: Clinical appearance of dogs after treatment

The rapid hematological recovery observed in the present study is consistent with previous reports demonstrating the beneficial effect of Filgrastim therapy in CPV-associated leukopenia (Areshkumar *et al.*, 2017; Gupta *et al.*, 2021) [1, 8].

Conclusion

The present case series demonstrates that Filgrastim can be an effective adjunct therapy for the management of severe leukopenia associated with canine parvoviral enteritis. When combined with intensive supportive therapy and antimicrobial treatment, Filgrastim contributes to rapid hematological recovery and improved clinical outcomes.

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