CASE REPORT
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SIRS, MODS AND IMHA ASSOCIATED WITH *BABESIA CANIS* INFECTION IN A GERMAN SHEPHERD PUP AND ITS THERAPEUTIC MANAGEMENT

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ABSTRACT

A two months old German shepherd pup was presented to Referral Veterinary Polyclinic, IVRI with a history of pyrexia, anorexia, lethargy and ascites since 10 days. Clinical examination revealed papery white mucous membrane, pyrexia (103 ^{0}F) and popliteal lymphadenopathy. Hematobiochemical evaluation revealed anaemia, thrombocytopenia, neutrophilia, lymphocytopenia and hypoproteinemia. On blood smear examination, it was found highly positive for *B.canis* infection. Ultrasonography of abdomen revealed hepatomegaly, ascites and hepatitis. The pup was successfully treated using Diminazine aceturate (3.5 mg/kg IM) along with diuretic (Furosemide) 4 mg/kg BID IV for 3 days. Supportive therapy using plasma volume expanders, protein supplements, antacid, antihistamine, anti-inflammatory, hematinics, hepatoprotectant, antioxidants and B complex vitamins was given. This report deals with clinical management of SIRS and MODS associated with *Babesia canis* infection in a German shepherd pup.

Keywords: SIRS, MODS, *B. canis,* Diminazine aceturate

INTRODUCTION

Canine babesiosis is a tick-borne disease caused by intra-erythrocytic protozoan parasites. Babesiosis in dogs is mainly caused by two different *Babesia* species, the large form designated as *Babesia canis* and small form named as *Babesia gibsoni* (Chethan *et al.,* 2016). *B. canis* is categorized into three subspecies *B. canisvogeli*, *B. caniscanis, B. Canisrossi* (Adam, 2012). *B. canis,* transmitted by *Rhipicephalus sanguineus,* is having global distribution (Prakash *et al.,* 2018). *B. canis* infection occurs mostly as sub-clinical form (Solano-Gallego *et al.,* 2008). It causes severe illness in young pups and is seen mostly as co-infection with *Ehrlichia canis* and *Hepatozoan canis* which are transmitted by the same vector (Thakur *et al.,* 2020). Severe corneal opacity and systemic illness noticed in pups with mixed

hemoparasitic infection (Raguvaran *et al*., 2019). In dogs, babesiosis occurs in two forms; complicated and uncomplicated. In uncomplicated babesiosis, main clinical manifestation is haemolytic anemia while complicated babesiosis result from host inflammatory response with multi organ failure (Omobowale *et al.,* 2017). Clinico-pathological findings in *B. canis* infection include regenerative immune mediated haemolytic anaemia, non regenerative anaemia, leucocytosis, leucopenia, thrombocytopenia, febrile illness, splenomegaly (Fonsec *et al.,* 2017).

CASE HISTORY AND OBSERVATIONS

A two months old German shepherd pup was presented to RVP, ICAR-IVRI with a history of pyrexia, nasal discharge, anorexia, lethargy and ascites since 10 days. On clinical examination, severe anaemia with papery white conjunctival and gingival mucous membrane (Fig.1a), pyrexia (103 ^{0}F) and popliteal lymphadenopathy were observed. On auscultation of lung area, crackles were observed. Peripheral blood smear examination showed the presence of larger form of *Babesia* spp. i.e. *B. canis* in the erythrocytes (Fig. 1b). Presence of spherocyte and microscopic RBC agglutination indicated severe haemolytic crisis. Anaemia and thrombocytopenia were evident in haematological evaluation (Table 1). Serum biochemistry revealed hypoproteinemia and elevated levels of liver and kidney markers (Table 1). Direct coombs test gave positive result (Fig. 1c). Ultrasonography of abdomen revealed hepatomegaly, ascites and mild splenomegaly (Fig. 1d). Pup was diagnosed with multi organ dysfunction syndrome (MODS) associated with *B. canis* infection.

TREATMENT AND DISCUSSION

Treatment was initiated using antiprotozoal drug, Diminazine aceturate (3.5 mg/kg IM). Even though, drug of choice for *B. canis* infection is Imidocarb dipropionate, due to inconvenience expressed by owner Diminazine aceturate was administered. Diminazine aceturate also tends to be more effective against large form of *Babesia* spp. Imidocarb is

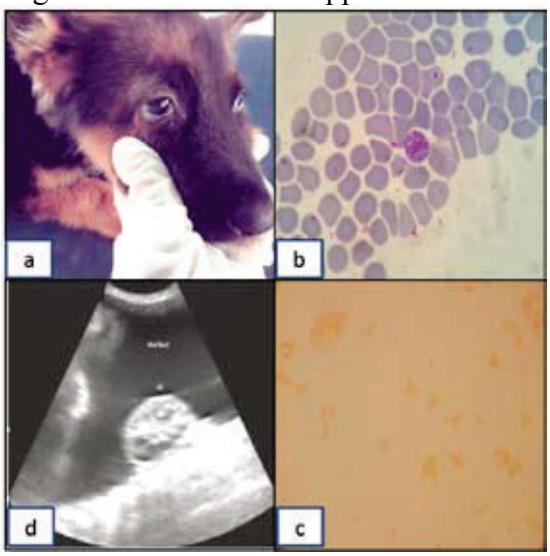

Fig. 1 a) Papery white mucous membrane b) Piroplasms inside RBCs (Giemsa stain × 1000) c) Positive Direct Coombs test d) Free peritoneal fluid

Table 1: Haemato-biochemical parameters of the patient before and after therapy

PARAMETER	DAY 0	Day 14	REFERENCE VALUE	KEY FINDING
RBC count (millions per mm³)	**2.86**	4.5	5-7.9	Anaemia
Haemoglobin(g/dl)	**5.2**	9	12-19	
WBC count (cells/mm³)	**17000**	10400	5000-14100	
Platelet count (lakhs/mm³**)**	**0.54**	2	2.1-6.2	Thrombocytopenia
Neutrophils (%)	86	66	58-85	Neutrophilia
Lymphocytes (%)	12	32	32-36.3	Lymphocytopenia
Monocytes (%)	2	2	0-5	
Total protein (g/dl)	**3.8**	5.5	5.4-7.5	Hypoproteinemia
Albumin (g/dl)	**1.8**	2.3	2.3-3.1	Hypoalbuminemia
Globulin (g/dl)	2	3.2	2.4-4.4	Hypoglobulinemia
A:G ratio	0.9	0.76	0.6-1.3	
BUN (mg/dl)	47	27	8-28	Acute renal damage
Creatinine (mg/dl)	4.9	1.8	0.5-1.7	
ALT (IU/L)	**178**	111	10-109	Hepatic injury

#Reference range: Kahn, C.M. (2010). The Merck Veterinary Manual, (10th edn.). Merck & Co., USA.

contraindicated in pets with compromised liver and kidney function.

Along with this treatment diuretic (Furosemide) @ 4 mg/kg BID IV for 3 days followed by oral furosemide-spironolactone combination for 4 days was given. Supportive therapy using plasma volume expanders (Haemaceel[1] @ 2ml/ Kg IV for 5 days), protein supplements (Astymin[2] @ 2 ml/Kg OD IV for 5 days), antacid (Pantoprazole @ 1mg/Kg IV), steroid (Predisolone acetate @ 1mg/ Kg OD PO for one week and tapered later), hematinics (Haemup[3] syrup@ ½ tsp BID PO), hepatoprotectant (Livo+[4] syrup @ 1/2 tsp OD PO) andantioxidants (N-acetylcysteine @ 30 mg/k IV) was given. Pup shown significant improvement after a week of therapy and cleared from *B. Canis* infection microscopically by 14th day. Microscopic examination was performed on day 7 and day 14.

Systemic inflammatory response syndrome (SIRS) and MODS occur in dogs with complicated babesiosis (Matijatko *et al.,* 2010). Host response to tissue injury and infection will cause SIRS. This inflammatory response cause oxidative injury to one or more organ systems which ultimately leads to MODS (Crnogaj *et al.,* 2017).In this case, involvement of liver, kidney and spleen indicates multi organ failure**.** Early diagnosis and treatment is important in preventing development of MODS. SIRS is considered to be present in if two or more of the following findings occur- tachycardia, tachypnea, hypo or hyperthermia, low or high leukocyte count(Okano *et al.,* 2002). MODS are considered to be present if there is

1 Abbott pharmaceuticals Ltd, 2 Tablets India Ltd, 3 Cadila pharmaceuticals Ltd, 4 Venttura pharmaceuticals Ltd

dysfunction of two or more systems like renal, hepatic, CNS, respiratory and muscular (Weiser, 1992). *B. canis* infection becomes fatal in immunosuppressed animals and there will be elevation of serum alanine amino transferase (ALT) and aspartate amino transferase (AST), and thrombocytopenia. Leucocyte count and neutrophil-lymphocyte ratio is used as a good diagnostic indicator to differentiate complicated and uncomplicated babesiosis (Omobowale *et al.,* 2017). Leucocytosis along with high neutrophil-lymphocyte ratio clearly depicted complicated form babesiosis in this pup.

Host will develop anti-erythrocyte membrane antibodies which result in erythrophagocytic activity of macrophages and ultimately result in immune mediated haemolytic anaemia (IMHA) (Bilwal *et al.,* 2017). Direct Coombs test give positive results in 85% of the cases.

Treatment of choice for *B. canis* infection is Imidocarb dispropionate. As a second choice, Diminazine aceturate can be used which will disrupt parasite's DNA synthesis and aerobic glycolysis. Supportive therapy will help to reduce the damage occurred to internal organs as a result of the infection.

CONCLUSION

Babesia canis infection in dogs is increasing day by day. Early diagnosis and treatment is important in order to save the life of the animal and to prevent the disease from progressing towards multiple organ failure.

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