

A Systematic Study on Biochemical Abnormalities associated with Canine Ehrlichiosis

J.P. Smitha and K. Vijayakumar

*Dept. of Veterinary Epidemiology and Preventive Medicine
College of Veterinary and Animal Sciences, Pookode, Wayanad-673576
Joint commissioner, Ministry of Agriculture, GOI, New Delhi*



Abstract

This study was envisaged to conduct a systematic study on biochemical parameters of definite cases of Ehrlichiosis in dogs. Sixty four animals showing symptoms suggestive of ehrlichiosis were taken for study. The disease was confirmed positive by two methods: examination of blood/buffy coat smear and indirect fluorescent antibody (IFA) test. The parameters were assessed in an apparently healthy group of animals, the control group (group I), group comprising of animals tested positive by both the diagnostic tests (group II) and group comprising of animals tested positive exclusively by IFA test (group III) Important biochemical parameters assessed included total protein, albumin, globulin, liver specific enzymes like alanine amino transferase (ALT) & alkaline phosphatase (AP) and serum creatinine. Significant changes ($P < 0.01$) in the values of Groups II & III were observed when compared to those of Group I. Prominent changes were seen associated with the values of globulin, total protein, albumin and hepatic enzymes among which, hyper globulinemia/hyper gamma-globulinemia is regarded as having definite bearing on the prediction of prognosis of the disease.

Key words: Ehrlichiosis, Biochemical parameters, canine

Introduction

Ehrlichiosis in dogs is an important tick-borne disease characterized by anemia, pancytopenia and severe debilitation, especially towards the terminal phase of the disease. The affected animals show various biochemical abnormalities associated with different stages of the disease. Some of these deviations are important in the sense that they

may provide the clinician with correct clues to make right diagnosis of the disease.

Materials and methods

The present study was the first systematic study in the state of Kerala on Ehrlichiosis in which a total of 64 dogs showing symptoms suggestive of Ehrlichiosis were included in the experimental group. The control group (Group I) consisted of six apparently normal healthy dogs presented to the hospital during the study period. Among the 64 animals presented with symptoms suggestive of ehrlichiosis such as elevated temperature, peripheral lymphadenopathy, congested mucosa and selective appetite, fifteen cases that proved positive both by blood smear examination and indirect fluorescent antibody test (IFAT) were taken as group II and 27 cases that proved positive by IFAT and negative by blood smear examination were taken as Group III. The important biochemical parameters estimated in this study included total serum protein (direct biuret method by Gormall et al. 1949), albumin (Bromocresol green method by Doumas et al. 1971), globulin, A/G ratio, serum enzymes alanine amino transferase (ALT), alkaline phosphatase (AP) and serum creatinine using Agappe diagnostic kits.

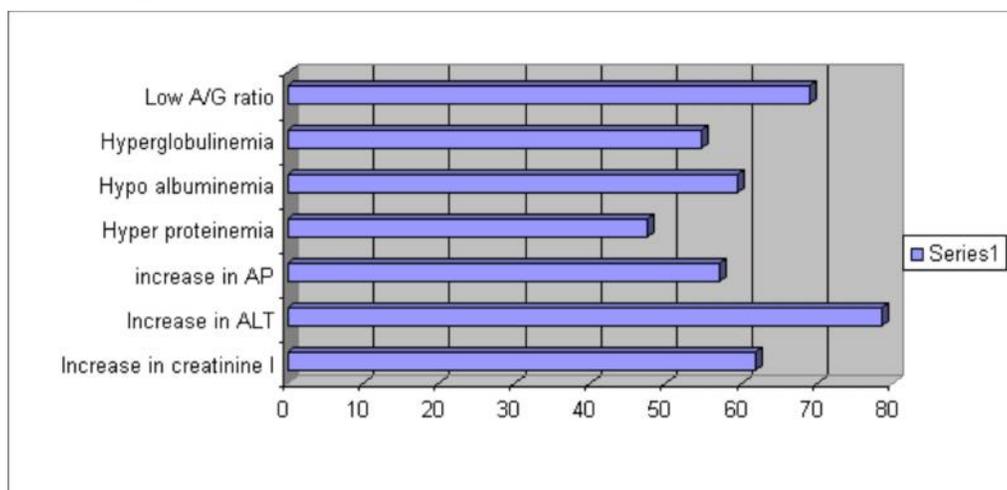
Results and discussion

Significant deviation of the serum profile of infected groups II and III when compared to that of the control group I is given in the table I. Biochemical abnormalities observed were elevated levels of serum enzymes ALT (78.6%) and alkaline phosphatase (57.1%), Creatinine level (54.8%) and low values for albumin (59.5%) and A/G ratio (69.1%). Similar findings were recorded by previous workers (Harrus et al., 1996; Neer, 1998).

Table I Serum profile in different groups of dogs

Group	No of animals	Total protein (g/dl)	Albumin(g/dl)	Globulin(g/dl)	A/G ratio	ALT(IU/l)	AP(IU/l)	Creatinine(mg/dl)
I	6	7.1±0.13	3.7±0.17	3.4±0.12	1.12±0.08	19.92±1.42	67.17±2.36	1.15±0.07
II	15	9.29±0.5	2.23±0.16	0.322±0.45	0.32±0.02	67.07±6.25	253.42±16.85	2.32±0.19
III	27	8.88±0.27	2.26±0.11	6.59±0.22	0.35±0.02	89.54±4.32	248.5±11.16	2.46±0.16
		*	^	**	**	**	**	**

*-Significant (p<0.05) ,**-Highly significant (p<0.01)

Percentage occurrence of biochemical abnormalities in is Ehrlichia canis infection

Total Protein

Harrus et al.(1996) attributed the hyperproteinemia associated with ehrlichiosis to the higher gamma globulin concentration. In this study, protein values of affected animals showed a wider range (5.5-13 g/dl). Among 47.6 % that showed hyperproteinemia a few cases were characterized by very high protein level. Hyperproteinemia with serum protein concentration exceeding 8g/dl has been reported in ehrlichiosis especially in the chronic phase of the disease (Weiser et al.,1991; Harrus et al .,1997).The gamma globulin response found during the first seven days after infection with E.canis is IgM and IgA, thereafter the IgG concentration will gradually increase and cause hyper proteinemia.

Albumin

Hypoalbuminemia was observed in majority (60%) of positive cases in this study, as observed in previous reports (Kuehn and

Gaunt,1985., Harrus et al., 1997).The hypoalbuminemia noticed in all stages of canine ehrlichiosis may be attributed to factors like anorexia and related reduction in protein uptake, peripheral loss to edematous inflammatory fluids as a result of increased vascular permeability and consequent to vasculitis. It may also occur as a compensatory mechanism for the hyperglobulinemic state for maintaining the osmotic pressure (Woody and Hoskins.,1991), decreased protein production due to concurrent mild liver affections (Reardon and Pierce,1981) or may be due to minimal change glomerulopathy (Codner et al., 1992).

Globulin

In this study 54.8 % of positive cases revealed hyperglobulinemia. Hypergamma globulinemia in canine monocytic ehrlichiosis is usually polyclonal. Gamma globulin concentration increases during the febrile phase and persists during sub clinical and

chronic phase (Ristic and Holland,1993).The persistence of higher values might be attributed to a committed B cell response to chronic antigenic stimulation by the infective organism indicating a prolonged duration of infection (Harrus et al., 1996a). Anyway this gamma-globulinemia may not be due to specific anti *E.canis* antibodies (that protect against reinfection) which suggests an exaggerated immune response to occur in ehrlichiosis with inadequate efficacy (Reardon and Pierce, 1981)

A/G ratio

A significant reduction in A/G ratio was observed in 69.1 % of positive cases in this study which was reported by previous workers (Waddle and Littman, 1988; Harrus et al., 1996).

Enzymes

Increased alanine aminotransferase (ALT) in the dog is specific for hepatic disease. A higher proportion of positive cases showing marked rise in ALT (78.6%) in this study is indicating pathologic changes in parenchyma associated with ehrlichiosis. Reardon and Pierce (1981) noticed that an increase in ALT activity occurred simultaneously with the development of many expanding foci of reticuloendothelial cells in the hepatic sinusoids which compressed and injured the adjacent hepatocytes leading to their necrosis and rise in the levels of serum ALT. But this might persist only for a short period (14-21 days). This explains why the serum enzyme abnormalities may not be noticed in all cases of ehrlichiosis.

Increased levels of serum alkaline phosphatase (AP) were noticed in 57.1% of positive cases that concurred with the previous reports (Harrus et al., 1997; Neer, 1998). In dogs the serum AP level can be utilized as an indicator of hepatic malfunction. Its elevation in canine serum is associated with active pathology in liver. However its increase is comparatively less when compared to that of ALT (which is dramatically increased) (Coles, 1986). Its estimation thus can be used as an

adjunct to estimation of ALT in detecting the liver damage.

Creatinine

Elevated levels of serum creatinine were observed in 61.9% of infected animals though many cases revealed only a marginal increase. Similar findings were earlier recorded by Waddle and Littman (1988) and Harrus et al. (1997). There are many reports of suggesting the pathological involvement of renal parenchyma in ehrlichiosis leading to azotemia that can be reflected as high creatinine level. Hildebrandt et al. (1973) observed subcapsular and focal haemorrhages near corticomedullary junction in kidneys of 42 dogs with ehrlichiosis. These affected kidneys revealed prominent plasmacytosis around glomeruli and interstitium. Codner et al. (1992) could observe marked deposition of immunoglobulins (Ig G & Ig M) in glomerular tufts of dogs with *E. canis* infection during acute phase of the disease. Chronic antigenic stimulation by this organism might induce immune complex glomerulonephritis. However, as azotemia may also arise due to pre-renal factors, interpretation of results must be careful when the changes are minimal.

Conclusion

In the current study, significant changes observed in infected groups when compared to that of control group included hyperproteinemia, hyperglobulinemia, hypoalbuminemia, increase in ALT, AP and serum creatinine.

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