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Evaluation of Haematological Parameters, Biochemical Parameters and Thyroxin Level in Dogs with Generalized Demodicosis

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Abstract: Canine demodicosis is a common non contagious skin disease caused by excessive proliferation of the normal skin commensal *Demodex* mites. Previous studies on demodectic mange infection in mammalian biosystem demonstrate that it produce Hematobiochemical changes due to the impact of stress caused by mites. Our study was conducted to find out the changes associated with hematological, biochemical parameters and thyroxin level of dogs suffering from generalized demodicosis. Blood samples were collected from a total of 15 dogs suffering from generalized demodicosis and used for evaluation of hematological and biochemical parameters and thyroxin level. Results from infected dogs showed extremely significant decrease in the value of PCV (<0.01) and statistically significant decrease in values of Hb and TEC (<0.05). Affected dogs also showed leukocytosis accompanied by neutrophilia and lymphopenia. Increased total serum protein and globulin with decrease in serum albumin level. Presence of hypothyroidism as demonstrated by reduced levels of free T4 and TSH.

Key words: Canine · Demodicosis · Hematology · Biochemistry · Thyroxin Level

INTRODUCTION

Skin disorders are among the most common health problems, they vary from acute self-limiting problems to chronic or long-lasting problems requiring life-time treatment [1]. Inadequate prevalence data on common disorders have hampered efforts to prioritize health reforms of dogs [2]. Canine demodicosis is a common non contagious inflammatory parasitic dermatosis characterized by excessive proliferation of *D. canis* within the hair follicles and sebaceous glands [3-7]. Receptivity of dogs to demodicosis is influenced by numerous intrinsic and extrinsic factors. Intrinsic factors like hereditary predisposition, alterations in skin's structure and biochemistry, immunological disorders, breed, age and hormonal status (hypothyroidism and hyperadrenocorticism). Extrinsic factors include alimentation, fitness, presence of stress factors and presence of other diseases or pathogens [8, 9]. Scott *et al.* [5] was classified demodicosis into localized and generalized forms based on the extent of the affected body area. In localized form, skin lesions are restricted to one body area with good prognosis and the majority of cases spontaneously resolved without miticidal treatment. Generalized form further classified into juvenile-onset and adult-onset, skin lesions spread over the whole body and have a poor prognosis. Literatures available on hematological, biochemical alterations and thyroxin level in demodicosis affected dogs are insufficient; therefore, the present study was conducted to evaluate the haemato-biochemical parameters and thyroxin level in dogs suffered from generalized demodicosis.

MATERIALS AND METHODS

Animals: In the present study, total number of (15) dogs were used with great consideration to animal welfare and under owner's permission during the period from 2013 to 2015, at the small animal-medicine teaching hospital, faculty of veterinary medicine, Cairo University, Egypt. All dogs were suffered from generalized demodicosis (Figs. 1 and 2) presented with at least one of the following criteria [7]: presence of five or more alopecic areas, a whole body area being affected or a pododemodicosis involving two or more feet. Demodicosis was confirmed by skin scraping and hair pluck technique (trichogram).

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Fig. 1: Great Dane dog suffer from generalized demodicosis.

Fig. 2: Dog with generalized demodicosis.

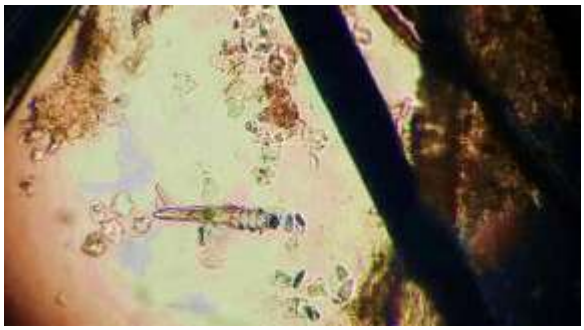

Fig. 3: Demodex mite under the microscope (X40).

All skin scraping samples were positive for *Demodex* mite (Fig. 3). Apparently healthy dogs (n= 10) that presented for routine health checks and vaccination without any skin lesions on physical examination were used as control group.

Blood Samples

Whole Blood Samples: EDTA whole blood samples (3 ml each) were collected from each dog from the cephalic vein (fore limb) or saphenous vein (hind limb) and used for estimation of hematological parameters [10] including packed cell volume (PCV),hemoglobin (Hb), Total erythrocyte count (TEC), Total Leucocyte count (TLC). Thin blood smears directly prepared and stained with diff-3 stain for differential leucocyte count (DLC).

Serum Samples: Blood samples were collected from diseased and apparently healthy dogs without using anticoagulants for separation of clear non hemolized serum. Sera was analyzed for ALT, AST, total protein, albumin, blood urea nitrogen (BUN) and creatinine (Stanbio, Texas, USA), total bilirubin and direct bilirubin (QCA,Tarragona, Spain)with manual analysis using spectrophotometer (APEL, PD-303 S, Japan). The remaining sera were stored at-20 °C for serological estimation of thyroid stimulating hormone (TSH) and thyroxin levels (T4) using ELISA kits (Chemux BioScience, San Francisco, USA) according to manufactures instructions.

Statistical Analysis: Statistical analysis was performed using Student's *t* test (STATISTICA for windows, version 5.1., Stat Soft, Inc. 1984-1996). P- values<0.05 were considered of statistical significance.

RESULTS AND DISCUSSION

The mean values of hematological, biochemical parameters and thyroxin level were illustrated in tables 1, 2 and 3.

Dogs with generalized demodicosis had extremely significant decrease in the value of PCV (<0.01) and statistically significant decrease in values of Hb and TEC (<0.05) which is in accordance with the findings of Patel *et al.* [11], Singh *et al.* [6], Beigh *et al.* [12] and Reddy *et al.* [13]. The decrease in the values of hemoglobin and TEC might be due to anemia caused by the loss of skin protein as reported by Deb *et al*. [14] or due to the stress arising from the disease as reported by Sakina *et al.* [15]. Leukocytosis, neutrophilia and lymphopenia were highly significant changes in generalized demodicosis. Leucogram findings come in accordance with Patel *et al.* [11], Dadhich and Khanna [16], Singh *et al.* [6], Sakina *et al*. [15], Beigh *et al*. [12] and Reddy *et al*. [13]. The previous changes were

Table 1: Mean erythrogram values of apparently healthy and demodicosis affected dogs (Mean±SD)

Parameters	Control group	Diseased group	P- value
PCV (%)	44.93±2.79	35.60±9.06	0.0007**
Haemoglobin (g/dl)	15.95±1.68	13.40±3.72	0.02*
TEC (million/cmm)	6.11±0.83	5.08±1.34	0.01*
MCV (fl)	74.39±8.28	73.58±13.34	0.84
MCH (pg)	26.36±3.33	26.06±5.33	0.84
MCHC (g/dl)	35.56±3.44	35.83±7.12	0.89

*P<0.05 (significant); **P<0.01(highly significant).

Table 2: Mean leucogram values of apparently healthy and demodicosis affected dogs (Mean±SD)

Parameters	Control group	Diseased group	P- value
TLC (10^3/mm^3)	11.42±2.95	17.89±6.71	0.001**
Neutrophils (%)	63.67±3.54	71.07±9.74	0.01*
Lymphocytes (%)	27.60±2.29	20.44±8.92	0.005**
Monocytes (%)	4.53±3.25	6.18±6.02	0.35
Eosinophils (%)	3.25±1.22	5.38±3.70	0.06

*P<0.05 (significant); **P<0.01(highly significant).

Table 3: Biochemical changes and thyroxin level in demodicosis affected dogs in comparison to control group.

Parameters	Control group	Diseased group	P- value
Total protein (g/dl)	6.789±0.638	7.953±2.354	0.04*
Albumin (g/dl)	3.417±0.383	2.661±0.568	0.0004**
Globulin (g/dl)	3.50±0.674	5.22±2.496	0.03*
A/G ratio	0.876±0.238	0.693±0.463	0.1
Total Bilirubin (mg/dl)	0.240±0.112	0.266±0.134	0.53
Direct Bilirubin (mg/dl)	0.128±0.046	0.157±0.084	0.24
Indirect Bilirubin (mg/dl)	0.150±0.080	0.154±0.066	0.86
ALT (IU/L)	18.63±7.288	21.14±9.726	0.38
AST (IU/L)	28.625±10.87	26.326±10.19	0.65
BUN (mg/dl)	14.39±2.92	15.69±6.73	0.493
Creatinine (mg/dl)	0.853±0.243	1.016±0.533	0.24
T4(nmol/l)	32.40±7.08	17.20±12.30	0.001**
TSH(IU/ml)	0.416±0.147	0.035±0.028	0.0001**

explained by Sakina *et al*. [15] who reported that generalized inflammation and response of leukocytes to prolonged antigenic stimulus in the form of chronic demodex mite infection may be responsible for leukocytosis. Lymphopenia was reported and may be due to the reason that cell mediated immunity plays an important role in fighting against demodex mites. There was no quite statistically significant change in the level of eosinophils (P= 0.06) and this finding come in accordance with Tsai *et al.* [17] who reported that dogs with demodicosis fell within the normal range for blood eosinophil concentration. Regarding biochemical analysis, there was no statistically significant difference in the level of AST, ALT, BUN, creatinine, total bilirubin, direct bilirubin, indirect bilirubin and A/G ratio between demodicosis affected dogs and apparently healthy one. Dogs with generalized demodicosis revealed elevated total serum protein, globulin and reduced albumin levels when compared with control group. These findings come in agreement with Hagiwara and Germano [18], Dadhich and Khanna [16] and Beigh *et al.* [12]. Hypoalbuminemia may be due to excessive break down of protein due to trauma of skin and proliferation of mites, hyperglobinaemia may be attributed to chronic skin disease as reported by Sakina *et al*. [15]. Also Jain [19] attributed hypoalbuminemia due to loss of albumin through injured skin. Increase in total protein values might be due to increased inflammatory response assorted with secondary bacterial infection, pyoderma [20]. There were statistically significant difference in the free T4 and TSH levels between dogs with recurrent generalized demodicosis and apparently healthy one. Our results come in accordance with Mederle *et al.* [8], Bate [21] and Mctaggart [22] who considered presence of an association between hypothyroidism and demodicosis, presumably because of suppression of the immune system allowing proliferation of mites. The increased numbers of mites and/or microbes due to immunosuppression can cause skin disease. But disagree with Reddy *et al.* [13] who found that dogs with demodicosis did not show any significant difference in total T4and free T4 levels when compare with health dogs.

CONCLUSION

In conclusion, the most consistent hematological and serum biochemical alterations associated with generalized demodicosis infection in dogs were reduced levels of PCV, Hb and TEC. Presence of leukocytosis, neutrophilia and lymphopenia. Increased total serum protein and globulin with decrease in serum albumin level. Presence of hypothyroidism as demonstrated by reduced levels of free T4 and TSH.

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