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Evaluation of Neutrophil-to-Lymphocyte Ratio with Metabolic, Inflammatory and Oxidative Stress Markers in Hypothyroid Dogs with Autoimmune Thyroiditis

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Abstract

LYMPHOCYTIC thyroiditis is an autoimmune-mediated destruction of thyroid tissue and considered as the most prevalent cause of canine hypothyroidism. This study aimed to evaluate the neutrophil-to-lymphocyte ratio (NLR) as a marker of inflammation in hypothyroid dogs with lymphocytic thyroiditis. Additionally, aimed to investigate the role of thyroid autoimmunity and oxidative stress in the pathophysiology of thyroid dysfunction and disease progression. Hypothyroidism was diagnosed in 51 dogs, among which 15 dogs were diagnosed with lymphocytic thyroiditis based on the presence of thyroglobulin autoantibodies (TgAA) in their serum, these 15 dogs were included in this study. Ten additional healthy dogs were included as the control group. The affected dogs in the present study showed a variety of clinical signs including dermatological and metabolic abnormalities along with significant alterations in the levels of total thyroxin (TT4), free thyroxin (FT4), and thyroid stimulating hormones (TSH). A statistically significant elevation of NLR was detected in dogs with lymphocytic thyroiditis when compared to healthy dogs. Serum biochemical analysis demonstrated significant changes in liver function, total protein, lipid profile and fructosamine. Oxidative stress biomarkers showed a significant decrease in catalase and superoxide dismutase with a statistically significant increase in Malondialdehyde level. The present study concluded that the combination between NLR and TgAA measurements offers a more comprehensive evaluation of autoimmune thyroiditis by reflecting both specific immune activity and systemic inflammation. Oxidative stress, closely linked to lymphocytic thyroiditis, acts as both a cause and effect of thyroid dysfunction, suggesting potential benefits of antioxidant therapy in some cases.

Keywords: Dogs, Hypothyroidism, lymphocytic thyroiditis, NLR, Oxidative stress, TgAA.

Introduction

Hypothyroidism is a medical condition resulting from reduced concentrations of biologically active thyroid hormones (T3 and T4) in the blood, and it is commonly acknowledged as a prevalent endocrine disorder, significantly affecting dog's health and well-being, it may be primary (thyroidal defect), secondary (pituitary defect) or tertiary (hypothalamic defect) [1].

Primary hypothyroidism is the most prevalent naturally occurring thyroid condition in dogs, representing more than 95% of diagnosed cases [2]. It is identified in two histologic forms: lymphocytic thyroiditis and idiopathic thyroid atrophy. In general, cases of hypothyroidism in dogs are approximately evenly distributed between these two causes [3]. Other causes, though far less common, include iodine deficiency, ingestion of goitrogens, congenital hypothyroidism, destruction of the thyroid gland due to neoplasia, certain medications, surgical thyroidectomy, and radioactive iodine treatment were recorded [2,4].

Lymphocytic thyroiditis in dogs was first identified in 1968 in a purebred Beagle colony, where its notable resemblance to human Hashimoto's thyroiditis was described. Since that initial report, it has been documented in numerous dog breeds and is now considered among the most frequently identified endocrine conditions in dogs [5].

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It is characterized by autoimmune inflammation of thyroid gland that marked by the infiltration of activated T-lymphocytes, macrophages and plasma cells into the thyroid tissue. In dogs, the major canine lymphocytic thyroiditis antigen is thyroglobulin. Thyroglobulin autoantibodies (TgAA) serve as a specific marker for lymphocytic thyroiditis [6].

The neutrophil-to-lymphocyte ratio (NLR) is one output of the complete blood count parameters that recently considered to be a promising and cost-effective biomarker for assessing systemic inflammation, proved valuable in different medical conditions [7]**.** It has been previously studied in human with Hashimotos thyroiditis [8].

Thyroid hormones are closely associated with oxidative stress, which arises from excessive production of pro-oxidants and impairment of the antioxidant defense system. This imbalance promotes the generation of free radicals and leads to the intracellular accumulation of reactive oxygen species (ROS) that can lead to damage in thyroid tissue [9]**.**

This study was designed to investigate the neutrophil-to-lymphocyte ratio (NLR) as a potential inflammatory biomarker in dogs with lymphocytic thyroiditis and to determine its relationship with another established inflammatory marker, C-reactive protein (CRP). Additionally, the present study aimed to elucidate the contribution of thyroid autoimmunity and oxidative stress to the pathophysiological mechanisms underlying thyroid dysfunction and disease progression.

Material and Methods

Animals

A total of 350 adult dogs (over 3 years of age) were presented to pet animal veterinary clinic at the Faculty of Veterinary Medicine, Benha University and private pet animal clinics located in Qalioubia governorate, Egypt, during the period from August 2022 to February 2025. 102 dogs with signs consistent with hypothyroidism (overweight and dermatological changes) were subjected to initial screening test for hypothyroidism by measuring TT4. Only 51 dogs showed a reduced TT4 level; these hypothyroid dogs were subsequently tested for the presence of TgAA. Only 23 dogs revealed positive TgAA. Among these cases 15 dogs were selected to be included in the study, that were diagnosed with lymphocytic thyroiditis (overt hypothyroidism) based on the combination of specific signs of hypothyroidism, thyroid function test results and the positive detection of TgAA in their serum, seven dogs with active infection (N= 2), inflammatory diseases (N=3) and hematological disorders(N=2) were excluded from the study. An additional group of 10 dogs, deemed clinically healthy, served as the control group. Their selection was based on normal findings from clinical, hematological (CBC), liver, kidney, heart and thyroid function evaluation.

Ethical approval

All protocols and animal care were conducted in accordance with guidelines prescribed by the Institutional Animal Care and Use Committee (IACUC) of Faculty of Veterinary Medicine, Benha University, Egypt with the approval number (BUFVTM300923). Samples were collected from diseased dogs after obtaining all owner's consent.

Samples

Blood samples were collected from each dog from the cephalic vein; part of the sample was collected with EDTA for CBC examination. Another part without anticoagulant, clotted at room temperature for 20 min, centrifuged at 3,000 rpm for 10 min, and then the clear non-hemolyzed serum samples were separated to be assayed by a commercial laboratory.

Serum analysis

Serum samples were analyzed to measure TT4 levels using veterinary-specific kits (Catalyst Total T4 Slide) and the Catalyst One Chemistry Analyzer (IDEXX Laboratories, Inc., Westbrook, Maine), following the manufacturer's instructions. FT4 and TSH concentrations were determined using an enzyme-linked fluorescent assay (VIDAS, bioMérieux). The presence of TgAA was assessed through qualitative enzyme-linked immunosorbent assay (ELISA) techniques**.**

Lipid profile, blood glucose level, liver function and protein profile were determined by using VIDAS, IDEXX CATALYST ONE. Catalase (CAT), superoxide dismutase (SOD), glutathione peroxidase (GPX) and Malondialdehyde (MDA), were evaluated in the collected serum using dedicated test kits (Bio- Diagnostic, Egypt).

Hematological analysis

The complete blood count (CBC) was performed using an automated hematology analyzer (Model No. 93-91098-00-GF). NLR was determined manually by dividing the neutrophils count by lymphocytes count as previously described [8]**.**

Statistical analysis

The statistical analysis was conducted using T-test and correlation using SPSS, ver. 25 (IBM Corp. Released 2013). Data were treated as a complete randomization design [10]. Shapiro-Wilk test was applied for data normality assessment. The significance level was set at P value < 0.05.

Results

Clinical Examination

The affected dogs in this study showed a broad scale of clinical signs including mainly non-inflammatory non-pruritic bilateral symmetrical alopecia, as well as alopecia in the tail, resulting in a characteristic "rat tail" appearance (Fig.1) in addition to overweight, lethargy and depression (Fig.2).

Serum analysis

Thyroid hormones evaluation of the affected dogs revealed a significant reduction in TT4 and FT4 values, along with a marked elevation in TSH levels as compared to the healthy control group Table (1). A positive result for TgAA was observed in the serum of the diseased dogs, confirming the presence of autoimmune thyroiditis.

Liver function, protein profile, lipid profile, glucose and fructosamnie changes are recorded in Table (2). The hypothyroid dogs showed a significant increase ($P < 0.05$) in Alkaline phosphatase (ALT), Alanine aminotransferase (ALP), total protein, total cholesterol, triglycerides, Low-density lipoprotein (LDL), Very low-density lipoprotein (VLDL) and fructosamine with a non-significant decrease in High-density lipoprotein (HDL) and glucose level compared to control group.

Oxidative stress biomarkers in affected dogs revealed a significant decrease in catalase and super oxide dismutase (SOD) with a non-significant decrease in glutathione peroxidase (GPX), as well as, a significant increase in Malondialdehyde (MDA) when compared to the control dogs. Additionally, the diseased cases showed a significant increase in C-reactive protein (CRP) level. These changes are recorded in Table (3).

Hematological analysis

A statistically significant decrease in RBCs, HGB values and HCT% was observed. In addition, there was a non-significant decrease in lymphocytes and platelets count. While there was a non-significant increase in total leucocyte and neutrophils count. The results revealed a significant increase in NLR in lymphocytic thyroiditis dogs as compared to control dogs Table (4).

The hypothyroid dogs with lymphocytic thyroiditis demonstrated a statistically significant increased NLR with a direct correlation with MDA and CRP as well as an indirect correlation with catalase, SOD and GPX of the same dogs. These changes are recorded in Table (5).

Discussion

This study was applied on fifteen dogs that were diagnosed with primary overt hypothyroidism caused by lymphocytic thyroiditis, depending on the presence of clinical signs of hypothyroidism, abnormal thyroid function test as well as the positive detection of TgAA in the serum of affected dogs.

Hypothyroidism is the most common endocrine disorder recorded in dogs, it may be primary or secondary according to the cause. Primary hypothyroidism is caused by defect in thyroid gland that indicated by lower TT4 level and increased concentration of TSH [11]. While secondary hypothyroidism is caused by defect in pituitary gland which responsible for TSH production. So, secondary hypothyroidism is evidenced by lower T4 and lower TSH concentration [12,2]. Our result is consistent with primary hypothyroidism, as the affected dogs in this study showed decreased levels of TT4 and FT4 in addition to higher concentration of TSH.

The main cause of primary hypothyroidism is lymphocytic thyroiditis which confirmed by positive detection of TgAA [13,14]. Due to the invasive nature and logistical limitations associated with thyroid biopsy for the diagnosis of thyroid disorders, the quantification of anti-thyroid antibodies, including TgAA, is utilized as a minimally invasive diagnostic alternative to confirm lymphocytic thyroiditis [15].

Lymphocytic thyroiditis has been identified into four stages based on the presence or absence of clinical signs, histopathological changes of thyroid gland, thyroid hormones concentration as well as absence or presence of TgAA, as following: silent thyroiditis, subclinical hypothyroidism, overt hypothyroidism and non-inflammatory overt hypothyroidism [2,15,16]. Hypothyroid dogs in our study revealed clinical signs of hypothyroidism, lower level of thyroxine hormones and increased TSH concentration as well as positive TgAA, all these findings are agreed with 3rd stage of lymphocytic thyroiditis that referred to overt hypothyroidism.

lymphocytic thyroiditis is marked by autoimmune inflammation of thyroid gland that marked by the infiltration of activated T-lymphocytes, plasma cells, and macrophages into the thyroid tissue [3]. Thyroid autoimmunity is investigated by evaluation of TgAA, while the thyroid inflammation can be indicated by evaluation of inflammatory markers such as NLR and CRP [8].

NLR is considered to be a simple, low cost marker of inflammation, has been studied in many medical conditions in dogs such as chronic enteropathy [17], different stages of heart failure [18], canine inflammatory bowel disease [17], canine systemic inflammatory response syndrome [19] and hypercortisolism [20]. It has been previously studied in human with Hashimotos thyroiditis but not studied in dogs with lymphocytic thyroiditis. So, this study was designed to evaluate the alteration in NLR as a marker of inflammation in lymphocytic thyroiditis in dogs.

Hematological analysis of the affected dogs revealed a significant decrease in RBC count, HGB concentration, and HCT%, indicating the presence of anemia. Additionally, our study demonstrated a significant increase in the NLR in dogs with lymphocytic thyroiditis. The observed anemia may be attributed to reduced plasma erythropoietin levels, decreased responsiveness of erythroid progenitor cells to erythropoietin, or a direct effect of thyroid hormones on early hematopoiesis and pluripotent stem cells [21].

The result of this study showed a direct positive correlation between NLR and CRP which is one of the most well-established inflammatory markers which responds immediately to infectious or inflammatory stimulus [22]. These results suggesting an underlying inflammatory response, similar results were recorded in previous studies in human [8,23,24].

Elevated NLR in Lymphocytic thyroiditis dogs may be attributed to thyroid gland autoimmunity, that defined as an immune response targeting thyroid tissue antigens mainly thyroglobulin [6]**.** The immune response is represented by activation of T and B lymphocytes, activated lymphocytes migrate to thyroid gland, where B cells produce autoantibodies, and T cells contribute to the destruction of thyroid follicular cells, migration of lymphocytes to thyroid gland may be contribute to reduction in circulating lymphocytes [25]. Additionally, both thyroid epithelial cells and infiltrating immune cells release pro-inflammatory cytokines, which exacerbate the autoimmune process and amplify inflammatory response [26]. Elevated circulating neutrophil counts alongside reduced lymphocyte counts are indicative markers of inflammatory diseases [27].

This autoimmune inflammatory condition leads to gradual damage of thyroid follicular cells, eventually compromising the gland's capacity to produce sufficient thyroid hormones. As hormone levels decline, overt hypothyroidism develops, leading to the onset of clinical symptoms [6].

Thyroid hormones are vital for the proper functioning of nearly all body systems. As a result, thyroid hormone reduction can lead to a broad spectrum of clinical signs, affecting metabolic, dermatological, reproductive, gastrointestinal, ocular, and neurological functions [2]. Dermatological and metabolic changes were the most commonly observed clinical manifestations recorded in the affected dogs of our study.

The dermatological features included non-inflammatory, non-pruritic, bilateral symmetrical alopecia, along with alopecia on the dorsal tail region, resulting in the characteristic "rat tail" appearance. The observed alopecia can be explained by the physiological role of thyroxine in promoting and sustaining the anagen phase of the hair growth cycle. A deficiency in thyroxine results in the premature shift of hair follicles into the telogen phase, leading to increased hair loss, impaired follicular regeneration, and subsequent alopecia [2,28].

Reduced metabolic rate resulting in reduction in energy and heat production which considered the main cause of lethargy, depression, overweight and heat intolerance that recorded in the affected dogs in our study, similar results were recorded [29,30,31]**.**

The catabolic effect of thyroid hormone includes modulating energy utilization from various dietary sources, such as carbohydrates and lipids [32]**.** So, thyroid hormones reduction resulted in cessation of theses process that evidenced by hyperlipidemia that represented by a significant elevation in total cholesterol, triglyceride, and LDL levels [33,34,1]**.**

Hypercholesterolemia may be attributed to the role of thyroid hormones in stimulating the synthesis, mobilization, and degradation of lipids, as well as enhancing the clearance of LDL (bad cholesterol) by upregulating hepatic LDL receptors responsible for converting LDL into HDL, which is subsequently excreted in bile. In hypothyroidism, these processes are suppressed, leading to lipid accumulation in plasma and an increase in LDL levels, resulting in hypercholesterolemia [2,35]**.** Hypothyroidism results in a reduction in lipoprotein lipase activity which impairs lipid metabolism and contributes to elevated triglyceride levels [36].

Hyperlipidemia resulted in fatty infiltration in liver that resulted in hepatopathy and myopathy which evidenced by elevated level of ALT and ALP enzymes in hypothyroid dogs [3,37]**.**

The affected dogs exhibited a significant increase in fructosamine which is a compound formed by a non-enzymatic glycation reaction between glucose and plasma proteins**.** That may have attributed to an anabolic effect of thyroid hormones on protein metabolism; therefore, a reduction in thyroid hormone levels leads to decreased protein synthesis and increased protein degradation, which results in elevated fructosamine levels [15]**.**

Additionally, this study aimed to investigate the relationship between autoimmune inflammation of thyroid gland and oxidative stress as well as their role in the disease progression.

Oxidative stress (OS) occurs when there is a disruption in the body's balance of antioxidant defenses and the production of ROS. Mitochondria represent the main site of ROS generation [38,37]**.**

Thyroid hormones physiologically regulate metabolism through their dual catabolic and anabolic actions, resulting in increased cellular oxygen consumption which act as a pivotal factor in the

generation of ROS. Concurrently, thyroid hormones play a crucial role in modulating the antioxidant defense mechanisms by functioning as both enzymatic and non-enzymatic free radical scavengers, thereby mitigating oxidative stress [39].

In hypothyroidism, mitochondrial respiratory chain dysfunction, suppressed metabolic process as well as a diminished antioxidant defense capacity result in elevated production of ROS, resulting in oxidative stress [40].

Our results indicated that hypothyroid dogs are more susceptible to oxidative stress compared to healthy dogs. That evidenced by a significant elevation in MDA level and a significant decrease in catalase and SOD, similar results were previously described [41,40].

In the current investigation, elevated MDA level may have attributed to elevated cholesterol levels and prolonged circulation of aging lipoproteins in hypothyroid dogs. These lipoproteins tend to accumulate in the bloodstream, making them more susceptible to oxidative processes, which consequently leads to increased levels of lipid peroxidation by products such as MDA [33, 42, 43].

In the present study, hypothyroid dogs showed a significant reduction in the level of catalase enzyme which responsible for decomposing hydrogen peroxide (H_2O_2) into water and oxygen. In hypothyroidism, catalase activity is often reduced, weakening the body's antioxidant defenses. As a result, excess hydrogen peroxide may accumulate and react with nitric oxide (NO), forming harmful hydroxyl radicals. These radicals can damage cell structures through a process called lipid peroxidation [41].

Another significant finding of this study is the reduced level of SOD. This reduction in SOD activity has also been reported in other studies of hypothyroidism [44,45]. However, some studies have shown no significant changes in SOD activity between hypothyroid and euthyroid subjects [46,47]. These discrepancies are likely due to differences in study design, subject populations, severity of hypothyroidism, and the presence of comorbid conditions [33].

SOD serves as the primary enzymatic defense against intracellular free radicals. It has been reported that the resulting accumulation of hydrogen peroxide can lead to the inactivation of SOD. Reduced SOD activity increases the vulnerability of cell membranes and other cellular components to oxidative damage [40].

Recent studies have demonstrated the role of oxidative stress in the development of alopecia. Oxidative stress can damage hair follicle cells, particularly the dermal papilla, which plays a key role in hair growth. Moreover, excessive free radicals can trigger inflammatory responses in the scalp, further harming hair follicles and contributing to hair loss. This process may lead to the appearance of alopecia, which is considered one of the main clinical signs of hypothyroidism [48,49,50].

Prolongation of autoimmune inflammatory condition and oxidative damage of thyroid tissue may result in thyroid atrophy [51,6] which considered end stage of lymphocytic thyroiditis as evident by initial degenerative changes in thyroid parenchyma, which progressed to sever inflammation, subsequent fibrosis, and thyroid gland destruction [2].

All the previous investigations explain the positive correlation of NLR with MDA and CRP as well as the negative correlation with catalase, SOD and GPX. As the autoimmune inflammation of thyroid gland is associated with an elevated NLR and also induces oxidative stress, as indicated by elevated ROS such as MDA alongside a marked reduction in antioxidant defense enzymes (catalase, SOD and GPX).

Conclusion

This study concluded that the assessment of hematological, biochemical, and oxidative stress markers is of great importance for evaluating the health status of hypothyroid dogs. While TgAA serves as a specific marker of autoimmune thyroiditis, NLR reflects the overall balance of the immune response and systemic inflammation. Therefore, combining TgAA and NLR measurements can enhance the evaluation by identifying concurrent systemic inflammatory activity that could influence disease progression.

There is a strong relationship between lymphocytic thyroiditis and oxidative stress, which is regarded as both a consequence of, and a contributor to, thyroid dysfunction and disease progression. This association also highlights potential therapeutic approaches, such as the use of antioxidant therapy in certain cases. Further comprehensive and prospective studies on a larger sample size are necessary to substantiate the findings of the present study.

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Declaration of conflict of interest

The authors declare that there is no conflict of interest.

TABLE 1. Thyroid function changes (mean±SE) in control healthy and hypothyroid dogs with lymphocytic thyroiditis.

Parameter	Group		P-value
	Control (N=10)	Lymphocytic thyroiditis (N= 15)	
TT4 (mg/dL)	2.13±0.02	1.17±0.15	0.019
FT4 (mlu/L)	1.56±0.07	0.95±0.16	0.037
TSH (pmol/L)	7.42±.84	32.05±2.8	0.0001

TT4: Total tetraiodothyroxin, FT4: Free thyroxine, TSH: Thyroid stimulating hormone.

TABLE 2. Hepatic and metabolic profiles alterations (mean±SE) in control and hypothyroid dogs with lymphocytic thyroiditis.

Parameter	Control (N= 10)	Lymphocytic thyroiditis (N=15)	P-value
ALP (U/L)	44.4±6.23	248.87±27	0.001
ALT (U/L)	37.2±6.4	103.37±4.65	0.000
Total protein (g/dL)	6.08±.36	7.81±0.12	0.006
Cholesterol (mg/dL)	133.8±1.9	508.44±7.24	0.016
Triglycerides (mg/dL)	73.8±4.68	199.26±12.6	0.029
HDL-chl (mg/dL)	53.82±4.43	55.97±4.61	0.668
LDL-chl (mg/dL)	64.88±5.39	233.57±19.4	0.001
VLDL-chl (mg/dL)	14.76±0.93	36.9±2.34	0.029
Fructosamine(µM/L)	262.6±4.45	386.87±19.6	0.015
Glucose (mg/dL)	83.6±2.92	93.46±10.64	0.639

ALP: Alkaline phosphatase. ALT: Alanine aminotransferase
HDL: High-density lipoprotein. LDL: Low-density lipoprotein. VLDL: Very low-density lipoprotein.

TABLE 3. Oxidative stress and inflammatory biomarkers (mean±SE) in control and hypothyroid dogs with lymphocytic thyroiditis.

Parameter	Control (N=10)	Lymphocytic thyroiditis (N= 15)	P-value
CAT (Umg Hb)	5.46±.54	1.55±0.12	0.049
SOD (Umg Hb)	10.89±.73	4.25±0.13	0.027
GPX (Umg Hb)	4.79±.56	1.65±0.13	0.094
MDA (nmol/mL)	13.49±1.02	29.65±1.48	0.029
CRP (mg/dL)	3.44±.43	8.37±0.52	0.012

CAT**:** catalase. SOD: superoxide dismutase. GPX: glutathione peroxidase
MDA: Malondialdehyde. CRP: C-reactive protein

TABLE 4. Hematological and NLR in control and hypothyroid dogs with lymphocytic thyroiditis.

Parameters	Control (N=10)	Lymphocytic thyroiditis (N=15)	P-value
RBCs (M/µL)	7.09±0.2	5.17±0.18	0.001
HGB (g/dL)	15.83±0.58	11.09±0.39	0.001
HCT (%)	47.66±.9	36.46±1.35	0.001
WBCs (K/ µL)	11.04±.73	13.59±.81	0.5
PLT (K/ µL)	228.55±27.66	224.13±20.6	0.9
NEU (K/µL)	6.95±.56	10.53±.65	0.07
LYM (K/µL)	2.91±.29	2.07±0.19	0.294
NLR	2.55±0.26	5.41±0.33	0. 01

TABLE 5. Correlation between NLR and oxidative stress and inflammatory markers in hypothyroid dogs with lymphocytic thyroiditis.

		NLR	CAT	SOD	GPX	MDA	CRP
NLR	Pearson Correlation	1.000	-0.467	-0.612	-0.437	0.723	0.372
	Sig. (2-tailed)		0.329	0.204	0.358	0.074	0.281
CAT	Pearson Correlation		1.000	.871	.979	-.882	-.867
	Sig. (2-tailed)			0.019	0.000	0.024	0.021
SOD	Pearson Correlation			1.000	.879	-.861	-.947
	Sig. (2-tailed)				0.014	0.018	0.007
GPX	Pearson Correlation				1.000	-.857	-.836
	Sig. (2-tailed)					0.024	0.036
MDA	Pearson Correlation					1.000	0.804
	Sig. (2-tailed)						0.052
CRP	Pearson Correlation						1.000
	Sig. (2-tailed)						

*. Correlation is significant at the 0.05 and 0.01 level
-Positive and negative number mean a direct and indirect correlation respectively.

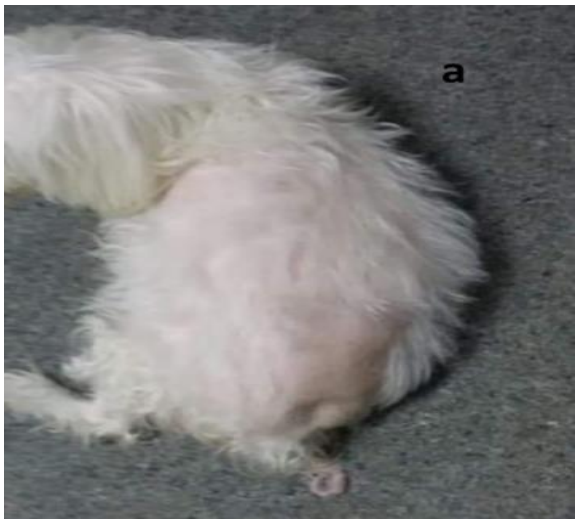

Fig.1 a: Alopecia and a characteristic rat tail appearance in Griffon dog affected by hypothyroidism.

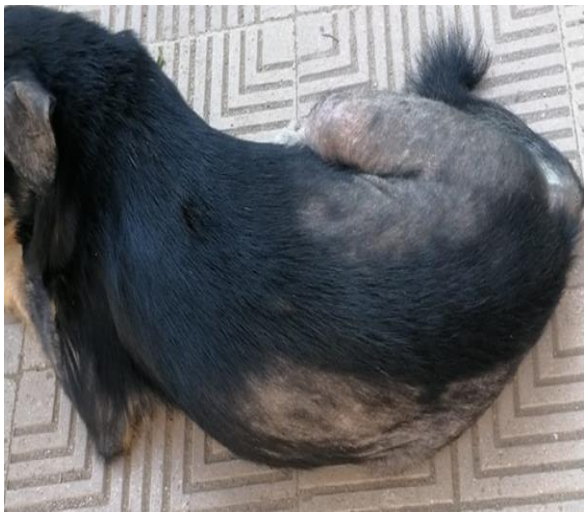

Fig.1 b: Non-inflammatory, non-pruritic bilateral truncal symmetrical alopecia in German shepherd dog affected by hypothyroidism.

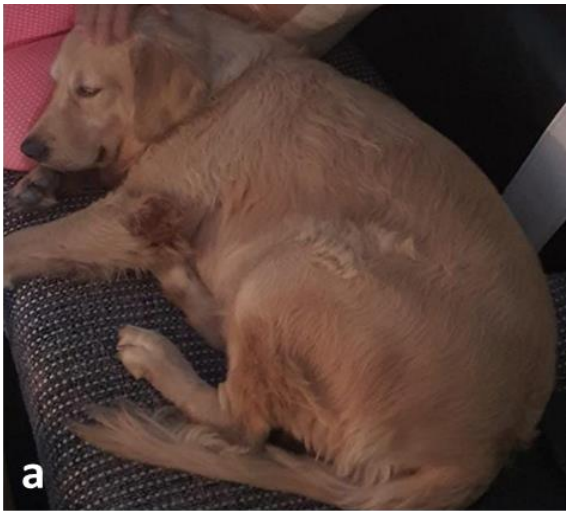

Fig. 2. Golden retriever dog showing depression, lethargy, overweight (a) and bilateral symmetrical alopecia with skin pigmentation (b).

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تقييم نسبة العدلات إلى الخلايا اللمفاوية والتغيرات في الإجهاد التأكسدي لدى الكلاب المصابة بقصور الغدة الدرقية الناتج عن التهاب الغدة الدرقية اللمفاوي

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الملخص

التهاب الغدة الدرقية اللمفاوي هو تدمير مناعي ذاتي لأنسجة الغدة الدرقية ويعتبر السبب الأكثر شيوعًا لقصور الغدة الدرقية في الكلاب. تهدف هذه الدراسة إلى تقييم نسبة العدلات إلى الخلايا اللمفاوية كعلامة للالتهاب في الكلاب المصابة بقصور الغدة الدرقية المصابة بالتهاب الغدة الدرقية الليمفاوي. بالإضافة إلى ذلك، تهدف إلى دراسة دور المناعة الذاتية للغدة الدرقية والإجهاد التأكسدي في الفسيولوجيا المرضية لخلل الغدة الدرقية وتطور المرض. تم تشخيص قصور الغدة الدرقية في 51 كلبًا، من بينها 15 كلبًا تم تشخيص إصابتهم بالتهاب الغدة الدرقية الليمفاوي بناءً على وجود الأجسام المضادة للغدة الدرقية في مصلهم، وتم تضمين هذه الكلاب الخمسة عشر في هذه الدراسة. تم تضمين عشرة كلاب صحية إضافية كمجموعة مراقبة.أظهرت الكلاب المصابة في الدراسة الحالية مجموعة متنوعة من العلامات السريرية بما في ذلك التشوهات الجلدية والتمثيل الغذائي، إلى جانب تغيرات كبيرة في مستويات هرمونات الغدة الدرقية. تم اكتشاف ارتفاع ذو دلالة إحصائية في نسبة العدلات إلى الخلايا اللمفاوية في الكلاب المصابة بالتهاب الغدة الدرقية الليمفاوي عند مقارنتها بالكلاب السليمة. أظهر التحليل الكيميائي الحيوي في المصل تغيرات كبيرة في وظائف الكبد والبروتين الكلي وملف الدهون والفركتوزامين. أظهرت المؤشرات الحيوية للإجهاد التأكسدي انخفاضاً معنوياً في مضادات الاكسدة مع زيادة معنوية إحصائياً في مستوى مؤشر الاجهاد التأكسدى. خلصت الدراسة الحالية إلى أن الجمع بين قياسات الاجسام المضادة و نسبة العدلات إلى الخلايا اللمفاوية يقدم تقييمًا أكثر شمولاً لالتهاب الغدة الدرقية المناعي الذاتي من خلال عكس كل من النشاط المناعي المحدد والالتهاب الجهازي.يعمل الإجهاد التأكسدي، المرتبط ارتباطًا وثيقًا بالتهاب الغدة الدرقية اللمفاوي، كسبب ونتيجة لخلل وظيفة الغدة الدرقية، مما يشير إلى فوائد محتملة للعلاج المضاد للأكسدة في بعض الحالات.

الكلمات الدالة: الكلاب، قصور الغدة الدرقية، التهاب الغدة الدرقية الليمفاوي، نسبة العدلات إلى الخلايا اللمفاوية، الإجهاد التأكسدي، الاجسام المضادة.