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RESULTS OF INSTRUMENTAL STUDIES OF THE THYROID CONDITION IN DOGS OF PATIENTS WITH HYPOTHYROIDISIS AGAINST OBESITY

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Summary

The article presents the results of ultrasonographic studies of the thyroid gland in domestic dogs with hypothyroidism, differentiation depending on the degree of fatness. The research was conducted during 2018-2020 on the basis of veterinary clinics in Poltava and Kharkiv. During this time, 11 domestic dogs were examined, in which a comprehensive examination diagnosed with hypothyroidism. These animals belonged to different breeds, had different sex and age. Depending on the degree of fattening of the animals were divided into two experimental groups. The first group of animals - with normal fatness; the second - with a clinical symptom of obesity.

After analyzing the results, we registered more significant changes in the structure of the thyroid gland in patients with hypothyroidism in dogs of the first experimental group compared with dogs with hypothyroidism on the background of obesity symptoms (second experimental group). This is a 100% increase in the echogenicity of the gland, a decrease in its size, uneven contours, as well as thickening of the capsule of the organ in 75% of animals.

A characteristic structural feature during ultrasonography of the thyroid gland in dogs with hypothyroidism on the background of obesity symptoms, was the presence of excessive amounts of subcutaneous tissue in the study area, which significantly complicated the interpretation of the results. In these dogs only inhomogeneity of structure with the centers of the increased acoustic density was noted.

More than half of the patients in the second group of dogs noted a decrease in the size of the gland; in the rest - the size of the body did not change. It should be noted that a significant number of animals observed an increase in the echogenicity of the gland, and the thickening of its capsule was found in less than half of the dogs in this group.

Common to all dogs with hypothyroidism, regardless of the presence or absence of obesity, found the heterogeneity of the structure of the pancreas. Increased echogenicity, decreased size of the thyroid gland, uneven contours and thickening of the capsule were more often visualized in hypothyroidism in dogs with normal fattening. The latter may be due to the presence of excessive amounts of subcutaneous tissue in the study area in obese dogs.

Key words: hypothyroidism, obesity, ultrasonography, dogs.

РЕЗУЛЬТАТИ ІНСТРУМЕНТАЛЬНИХ ДОСЛІДЖЕНЬ СТАНУ ЩИТОПОДІБНОЇ ЗАЛОЗИ В СОБАК ЗА ГІПОТИРЕОЗУ НА ТЛІ ОЖИРІННЯ

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Анотація

У статті наведені результати ультрасонографічних досліджень щитоподібної залози у свійських собак хворих на гіпотиреоз, проведено диференціацію

залежно від ступеню вгодованості. Дослідження проводили впродовж 2018-2020 років на базі клінік ветеринарної медицини м. Полтава та м. Харків. За цей час було досліджено 11 свійських собак, в яких за комплексного обстеження встановлений діагноз гіпотиреоз. Означені тварини належали до різних порід, мали різну статеву та вікову приналежність. Залежно від ступеню вгодованості тварин розподілили на дві дослідні групи. Перша група тварин – з нормальною вгодованістю; друга – із клінічним симптомом ожиріння.

Провівши аналіз отриманих результатів нами зареєстровано більш значні зміни у структурі щитоподібної залози у хворих на гіпотиреоз собак першої дослідної групи у порівнянні із собаками за гіпотиреозу на тлі симптому ожиріння (друга дослідна група). Це – стовідсоткове зростання ехогенності залози, зменшення її розміру, нерівність контурів, а також потовщення капсули органу у 75 % тварин.

Характерною структурною особливістю під час ультрасонографії щитоподібної залози в собак, хворих на гіпотиреоз на тлі симптому ожиріння, була наявність надмірної кількості підшкірної клітковини у досліджуваній ділянці, що значно ускладнювало інтерпретацію результатів. Саме у цих собак відмічали лише неоднорідність структури із вогнищами підвищеної акустичної щільності.

У понад половини хворих собак з другої групи відмічали зменшення розмірів залози; у решти – розмір органу не змінювався. Слід відмітити, що у значної кількості тварин спостерігали підвищення ехогенності залози, а потовщення її капсули встановили у менш ніж половини собак цієї групи.

Спільним для всіх собак, хворих на гіпотиреоз незалежно від наявності або відсутності ожиріння, встановлено неоднорідність структури підшлункової залози. Підвищення ехогенності, зменшення розміру щитоподібної залози, нерівність її контурів та потовщення капсули частіше візуалізувались за гіпотиреозу в собак із нормальною вгодованістю.

Ключові слова: гіпотиреоз, ожиріння, ультрасонографія, собаки**.**

РЕЗУЛЬТАТЫ ИНСТРУМЕНТАЛЬНЫХ ИССЛЕДОВАНИЙ СОСТОЯНИЯ ЩИТОВИДНОЙ ЖЕЛЕЗЫ У СОБАК ПРИ ГИПОТИРЕОЗЕ НА ФОНЕ ОЖИРЕНИЯ

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Аннотация

В статье приведены результаты ультрасонографических исследований щитовидной железы у домашних собак больных гипотиреозом, проведено дифференциацию в зависимости от степени упитанности. За время исследований было исследовано 11 собак с диагнозом гипотиреоз. Были выделены две группы в зависимости от степени упитанности животных. Первая - с нормальной упитанности; вторая - с клиническим симптомом ожирения.

Зарегистрировано значительные изменения в структуре щитовидной железы собак первой группы - стопроцентное величение эхогенности железы, уменьшения ее размера, неровность контуров, а также утолщение капсулы органа (75%).

Для большинства собак второй группы характернім біло уменьшение размеров железы; реже - размер органа не менялся.

Общим признаком для собак была неоднородность структуры поджелудочной железы. Повышение эхогенности, уменьшение размера щитовидной железы, неровность ее контуров и утолщение капсулы чаще визуализировались у больных собак с нормальной упитанности.

Ключевые слова: гипотиреоз, ожирение, ультрасонография, собаки.

Introduction

It is believed that in most cases, the development of excess body weight in animals causes a violation of the metabolism of thyroid hormones [1]. The most significant

effects on the concentration of thyroid hormones in the serum are the activity of their metabolism and transportation [2]. There is a close link between the metabolism of proteins and thyroid hormones. This relationship is explained by the fact that the latter (T4 and T3) are almost completely bound to proteins [3]. Therefore, most disorders of protein conjugation, in the future, may affect the total concentration in the serum of thyroid hormones. These processes also cause a long half-life of T4 (10-16 hours) [4,5]. The major proteins that interact with thyroid hormones are thyroxine-binding globulin, thyroxine-binding prealbumin, albumin, and high-density lipoprotein (HDL) and HDL2. It should be noted that the half-life of T3 is much shorter than the previous one (up to 6 hours). For T3, the major transport proteins are albumin and thyroxine-binding globulin [1,6]. Some researchers claim that the measurement of free hormones provides an accurate assessment of thyroid status, compared with the total concentration of hormones. Because only unbound (free) hormone can enter cells and be excreted [7,8].

Measuring the total concentration of thyroid hormones in the blood serum is the most standard definition thyroid function animals [8]. Most often, the concentrations of T4 and T3 are established, in clinical practice their metabolites are determined quite rarely [9,10].

When assessing the functional state of the thyroid gland in dogs, the concentration of total T4 is usually more reliable than the concentration of total T3. According to the literature in the serum of patients with hypothyroidism, the concentration of total T4 increases in almost everyone, although the concentration in the serum of total T3 is registered in a small number of dogs (15-50%) and may be within physiological fluctuations for this species [8]. Probably, this can be explained by the peculiarities of T3 secretion by the thyroid gland, as there is a directly proportional connection with the increase in thyroid-stimulating hormone (TSH), which can often be registered for hypothyroidism [11,12]. That is why it is effective to determine the concentration of T3 after determining the concentration of total T4 in the serum of animals, as the latter indicator has a higher sensitivity [13,14].

Actually thyroid gland secretes hormones thyroxine 1 (1 tetrayodtyronin) and 1-

triiodothyronine [15]. Iodine that comes with food is actively involved in the synthesis of both hormones [16]. Iodine interacts with the amino acid Tyrosine, resulting in the formation of compounds - mono- and diiodotyrosine (precursors of thyroid hormones). As part of a special protein - thyroglobulin in the follicles of the thyroid gland are deposited newly synthesized thyroxine and triiodothyronine. To release into the blood, hormones are cleaved from the protein by proteolytic enzymes. These processes are regulated by thyroid-stimulating hormone 17-19]. Because the body is a holistic system, the metabolism undergoes pathological changes due to a decrease in thyroxine levels. Similar changes occur in all types of metabolism, with the exception of lipid metabolism (increase in serum cholesterol, triglycerol, low and very low density lipoprotein fractions), which in turn leads to a clinical manifestation - increased fatness in sick animals as a basis for obesity symptoms. [3,7].

In addition to determining the functional state of the thyroid gland in dogs with hypothyroidism, it is important to study the structural changes of the body. Most often, ultrasonographic examination is performed to assess the condition of the thyroid gland and surrounding tissues (lymph nodes, blood vessels) and determine the size of both parts of the gland [20]. But it should be remembered that sometimes, due to functional insufficiency, structural changes may not be identified [21]. The main indicators for instrumental research are neoplasms in this area, clinical signs of endocrine disorders, routine biopsy of thyroid tissue [2,6,22]. Therefore, the use of instrumental research methods is relevant and helps in establishing the diagnosis.

In view of the above information, the **aim** of the work was ultrasonographic examination of the thyroid gland in overweight dogs with hypothyroidism.

The **main tasks** were determined: to conduct ultrasonographic examination of the thyroid gland in dogs with hypothyroidism; ultrasonographic examination of the thyroid gland in clinically healthy animals; compare the results.

Materials and methods of research

We analyzed the reporting documentation and statistical processing of the obtained data of veterinary clinics of different cities of Ukraine, namely Poltava - veterinary clinics at the Department of Therapy named after Professor PI Lokes Poltava State

Agrarian Academy, VetTochka "ПЕС+КІТ", «Vet Comfort»; Kharkiv - Veterinary Clinic «ПЕС+КІТ» for 2018-2020.

During the study, 11 domestic dogs were examined, in which a comprehensive examination diagnosed with hypothyroidism. The animals belonged to different breeds, had different sexes (six females and five males) and age.

We took 15 domestic dogs for control without visible signs of any pathology.

With the diagnosis of "hypothyroidism" in dogs, we identified two groups: the first - with normal fatness; the second - with a clinical symptom of obesity.

Research results and their discussion

It is known that normally the thyroid gland in dogs has clear boundaries, homogeneous structure and characteristic structure [23,24]. The study is performed in the area of the cranial third of the neck along the axis, slightly medially from the carotid artery and caudally from the larynx [25].

By analyzing the symptoms of the disease, we registered significant changes in the structure of the thyroid gland in dogs with hypothyroidism of the first experimental group (Table) in comparison with dogs with hypothyroidism on the background of obesity symptoms (second experimental group). This is a 100% increase in the echogenicity of the gland, a decrease in its size, uneven contours, as well as thickening of the capsule of the organ in 75% of animals. Normally, the thyroid gland in the transverse scan is visualized as a triangle, or has a rounded structure [21,26].

Table

Ultrasonographic symptoms of the thyroid gland in hypothyroidism in dogs

Symptoms of thyroid by ultrasound	Clinically healthy dogs, n=15		Hypothyroidism, the first group, n=4		Hypothyroidism, the second group, n=7	
	number	%	number	%	number	%
Increased echogenicity	0	0,0	4	100,0	5	71,4
Heterogeneity of structure	0	0,0	4	100,0	7	100,0
Homogeneity of structure	15	100,0	0	0,0	0	0,0
Size not changed	15	100,0	0	0,0	3	42,9
Increase in size	0	0,0	0	0,0	0	0,0

The size is reduced	0	0,0	4	100,0	4	57,1
Uneven contours	0	0,0	4	100,0	7	0,0
Capsule thickening	0	0,0	3	75,0	3	42,9

A characteristic structural feature during ultrasound of the thyroid gland in dogs with hypothyroidism on the background of obesity symptoms, was the presence of excessive amounts of subcutaneous tissue in the study area (Fig. 1), which significantly complicated the interpretation of the results [26]. In 100% of dogs, only the heterogeneity of the structure with foci of high acoustic density was noted (Fig. 2).

Fig. 1. Ultrasonography of the thyroid gland of a dog with hypothyroidism. Husky dog, age 9 years

Fig. 2. Ultrasonogram of the dog's thyroid gland in hypothyroidism on the background of obesity (increased echogenicity, compaction of the structure). Husky dog, age 9 years

Other symptoms were observed in a smaller proportion of animals compared

with the number of pathological changes in dogs of the first experimental group. In particular, in four of the seven sick dogs (57.1%) from the second group, a decrease in the size of the gland was registered; in the rest - the size of the body had not changed. Meanwhile, in 71.4% of animals there was an increase in the echogenicity of the gland, and thickening of its capsule was found in 42.9% of dogs with hypothyroidism on the background of obesity.

Thus, during echosonographic examination of dogs with hypothyroidism, it was found that, regardless of the presence or absence of obesity, a common symptom of structural disorders of the thyroid gland in 100% of animals is the heterogeneity of its structure. Increased echogenicity, decreased size of the thyroid gland, uneven contours and thickening of the capsule were more often visualized in hypothyroidism in dogs with normal fattening. This may be due to the presence of excessive subcutaneous tissue in the study area in excessively obese dogs.

Conclusions. It was found that 100% of dogs with hypothyroidism on the background of obesity manifests heterogeneity of the thyroid gland. In 71.4% of sick animals there is an increase in the echogenicity of the gland, a decrease in its size (57.1%) and thickening of the capsule (42.9%).

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