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CASE REPORT

Primary Hypothyroidism in An Adult Cat

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ABSTRACT

A 10-year-old cross breed female cat was brought with the complaint of weight gain while only the same amount of food was given. As a result of the evaluation of clinical examination, anamnesis, laboratory results and thyroid panel parameters, a rare hypothyroid disease in cats was determined. Levotroxine was used in the treatment and after 1.5 months, the parameters were within normal ranges at the control. As a result, the opinion that primary hypothyroidism in cats has gained more importance in veterinary endocrinology in recent years compared to previous years.

Keywords: T4, FT4, Cat, Hypothyroidism, Feline Endocrinology

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Yetişkin Bir Kedide Primer Hipotroidizm

ÖZ

Bu olgunun materyalini aynı miktarda günlük mama verilmesine rağmen kilo artışı meydana gelen 10 yaşındaki melez ırkı dişi kedi oluşturdu. Klinik muayene, anamnez, laboratuar sonuçları ve troid paneli parametrelerinin sonuçlarının değerlendirilmesi sonucunda kedilerde nadir görülen hipotroid hastalığı belirlendi. Tedavisinde levotroksin kullanıldı ve 1,5 ay sonra kontrol değerlerinde parametreler normal aralıklar arasında elde edildi. Sonuç olarak son yıllarda önceki yıllara göre kedilerde hipotroid olabileceği görüşü veteriner endokrinolojisinde daha çok önem kazanmıştır.

Anahtar kelimeler: Hipotroidizm, Kedi, Kedi Endokrinolojisi, T4, FT4

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INTRODUCTION

A disorder that may occur at any point in the hypothalamus-pituitary-thyroid axis causes thyroid hormone deficiency, but in 95% of clinically observed hypothyroidism events, the problem is the disorders occurring in the thyroid gland itself (primary hypothyroidism). The two most common causes of hypothyroidism in adult are lymphocytic thyroiditis and atrophy of the thyroid gland, and these have been reported to play an equal role in hypothyroidism. Less common causes of hypothyroidism are iatrogenic conditions, tumors developing in the thyroid gland, and congenital (or developing at a young age) hypothyroidism (Reusch et al 2015, Sevinç and Koral 2017).

It is a clinical condition resulting from insufficient secretion of tetraiodothyronine (T4, levotroxine, thyroxine), triiodothyronine (T3, liothyronine) by the thyroid gland (Chastain and Panciera 1995). 80-90% of the secreted hormone is T4 and 10-20% is T3. Biologically, T3 is 10 times more active than T4 on a cellular basis (Sevinç and Koral 2017). Thyroid hormone synthesis and secretion are regulated by extrathyroidal (thyrotropin, TSH) and intratrodial (autoregulatory) mechanisms. Thyrotropin (TSH) is the major modulator of thyroid activity and the result of this activity is the secretion of thyroid hormones. TSH secreted from the pituitary gland; It is regulated by the negative feedback mechanism from the thyroid hormone. The regulation of the thyroid hormone, namely the TSH feedback loop, is regulated by the thyrotropin-releasing hormone (TRH) secreted from the hypothalamus (Reusch et al 2015).

Clinical findings of hypothyroidism are weight gain, mental dullness, bilateral trunkal non-pruritic alopecia, exercise intolerance. Most dogs become obese due to the reduced metabolic rate and increased appetite. Interestingly, most pet owners even say that their animals start to gain weight despite not being hungry and having the same appetite. Most clinical signs in cat were similar to those in dogs (Rand et al 1993). Due to decreased metabolic rate, heat production is reduced. Therefore, some of the patients are hypothermic (Aytuğ 2011). Skin-related problems often occur in hypothyroidism. The skin may be dry or greasy, with a malodorous characterized by scale. One of the most important findings is bilateral, symmetrical, non-pruritic truncal alopecia. As a result of hair loss in tail, a condition called mouse tail occurs. (Kemppainen 2001, Schoeman 2011, Sevinç and Koral 2017). Weight gain, hypothermia and bradycardia can be observed in hypothyroidism in cats. (Scott-Moncrieff 2007).

As a laboratory finding in hypothyroidism, as well as decrease in thyroid hormones occur with hypercholesterolemia, normocytic normochromic anemia, elevated in liver enzymes such as ALT, AST, and ALP (Sevinç and Koral 2017). The diagnosis of the hypothyroidism is made by measuring serum total T4 and total T3 concentrations. It causes; a decrease in total T4 due to the disease and drug use that causes the euthyroid sick syndrome mentioned Table 1 and an increase in the total T3 concentration. Therefore, the specificity of measuring total T4 alone to diagnosis of hypotyhroidism is 70%. Free T4 (FT4); It is the form that is not bound to proteins in the T4 fraction and is free at the tissues. Free T4 concentration is measured by equilibrium dialysis method. The determination of free T4 and free T3 is used in human and veterinary medicine to differentiate the diagnosis of euthyroid sick syndrome from thyroid diseases. FT4 is used to determine the definitive diagnosis hypothyroidism, as it is not be affected by drugs and the diseases mentioned Table 1. While TT4 and FT4 levels decrease in hypothyroidism, TSH level becomes normal or high (Greco 2006, Sevinç and Koral 2017). Table 1 shows the change in total T4, free T4 and TSH to differentiate hypothyroidism and euthyroid sick syndrome. Thyroid hormones are suppressed by the use of drugs such as glucocorticoid, phenobarbutal, primidone, diazepam, sulfonamide, carprofen, aspirin, meloxicam and unbalanced nutrition. In addition, diabetes mellitus, liver diseases, chronic renal failure, hyperadrenocorticism, renal and heart failures often reduce the concentration of thyroid hormones. These cases cause decreasing in the thyroid hormones and are called euthyroid sick syndrome (Daminet 2010, Sevinç and Koral 2017).

Sodium levothyroxine as synthetic T4 is the first treatment option. The recommended initial dose of treatment is 20-44 μg/kg twice a day (Greco 2016).

CASE HISTORY

A 10-year-old cross breed female cat was brought with the complaint of severe weight gain despite eating the same amount of food. The clinical examination performed was normal and as a result of biochemical parameter, an increase in ALT, ALP, glucose and cholesterol was determined. Biochemical parameters were measured in the fuji nx-600 (Japan) instrument. Red blood cells (RBC), haematocrit (Hct), haemoglobin (Hb), mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) were measured in Mindray BC-5000 vet (China). FT4, TT4, TSH were measured in animal laboratory. In addition, microcytic hypochromic anemia was determined in the complete blood count. No glycosuria was observed in the urine examination.

Table 1. Hypothyroidism-euthyroid sick syndrome table of thyroid hormones.

	FT4	TT4	TSH
Hypothyroidism	**Low**	**Low or Low-Normal**	**High**
Euthyroid sick syndrome	**Normal**	**Low or Normal**	**Normal or Slightly increase in recovery**

After confirming that the cat did not use any other medication drug or did not have any disease in the anamnesis, the thyroid panel (TT4, FT4, TSH) was measured. Thyroid panel parameters was measured in special animal laboratory. A decrease in TT4 and FT4 levels and an increase in TSH levels were determined (Table 2). According to the thyroid panel, a rare diagnosis of hypothyroidism in cats has been made. Twice a day levotroxine treatment at a dose of 20 μg/kg was started immediately. At the 1.5 months later, it was observed that TT4, FT4 and other parameters returned to normal reference value (Table 2). The complaint of weight gain, which is a clinical symptom, disappeared immediately and weight control was achieved.

Table 2. The cat's laboratory results on the first day and control laboratory results of the cat after 1.5 months later

PARAMETRES	RESULTS of FIRST DAY	RESULTS of AFTER 1.5 MONTHS	REFERENCE VALUES (Turgut 2000)
FT4 (ng/dL)	0.68	1.4	1.0-2.5
TT4 (ug/dL)	0.50	1.6	1.5-5.0
TSH (ng/dL)	0.45	0.26	0-0.38
ALT (U/L)	117	88	10-80
ALP (U/L)	58	43	10-80
Glucose (mg/dL)	268	173	70-150
GGT (U/L)	10	10	1-10
Cholesterol (mg/dL)	187	154	90-205
RBC (10^{12}/L)	3.70	4.70	5.0-10.0
HCT (%)	24.20	29	24-45
Hb (g/dL)	8.20	9.10	8.0-15.0
MCV (fL)	30	41	37-49
MCHC (g/l)	260	300	290-360

DISCUSSION

Naturally occurring hypothyroidism in cats is very rare. When TT4 is decreased in the cats, it is generally thought that non-thyroid diseases cause this decrease. Sometimes, a decrease in TT4 level can be observed due to the overdose of drugs used in the treatment of hyperthyroidism. The symptoms of hypothyroidism in cats are the same as in dogs. As reported by researchers
(Tanase et al. 1991, Greco 2006, Scott-Moncrieff 2007), in cats with hypothyroidism, weight gain was also detected in this case despite decreased or normal appetite.

Total T4 contains both bound and free T4. More than 99% of the T4 hormone is "protein-bound". This means it is bound to binding proteins in the blood and can never reach the tissues. Therefore, the TT4 result alone can often lead to wrong interpretations. With using medication or any other disease, it can change the amount of T4 bound to proteins in the blood. Therefore, determination of TT4 concentration in

thyroid disorders is not a definite indicator alone, it must be evaluated together with FT4 (Scott-Moncrieff 2007, Dodds and Laverdure 2011). It has been reported that total T4, total T3, free T4, and free T3 can be evaluated in determining thyroid disorder in animals, but it is more reliable to evaluate TT4 and FT4 together in the diagnosis of the hypothyroidism (Scott-Moncrieff 2007, Daminet 2010, Dodds and Laverdure 2011). However, since the concentration of free T4 is not affected by the protein level in the blood, it is thought to be more reliable than total T4 in evaluating thyroid activity (Ferguson 1994, Scott-Moncrieff 2007, Daminet 2010, Dodds and Laverdure 2011). In this case report; as a result of the thyroid panel examinations, a decrease in TT4 and FT4 levels and an increase in TSH levels were determined. With these results, the cat in our case was diagnosed with primary hypothyroidism. The diagnosis of primary hypothyroidism in the cat in this case is compatible with Greco (2006), Scott-Moncrieff (2007), Dodds and Laverdure (2011). Clinicopathologic findings such as normocytic normochromic anemia resulting from erythropoeitin deficiency, decreased bone marrow activity, and decreased serum iron and iron-binding capacity would be expected to be observed in approximately 30% of hypothyroid cats (Greco 2016). In this case report, the cat's laboratory results on the first day showed us microcytic hypochromic anemia. This type of anemia is related to decreased serum iron and iron-binding capacity.

In the treatment of hypothyroidism, thyroxine (thyroxine; that is T4) is applied. For this purpose, synthetic thyroid hormones; it is more preferred because it stays as a standard better and longer. Sodium levothyroxine as synthetic T4 is the first treatment option. The half-life of levotroxine is 12-16 hours and peak concentration is reached within 4-12 hours after administration. The recommended initial dose of treatment is 20-44 μg/kg twice a day (Greco 2016). In this case, levotroxine treatment was started at a dose of 20 μg/kg twice a day. The complaint of weight gain, which is a clinical symptom, disappeared immediately and weight control was achieved. At the follow-up 1.5 months later, it was observed that TT4, FT4 and other parameters returned to normal values (Table 2). As reported by the researchers, levotroxine administration was also seen in this case, to be effective in cat hypothyroidism

CONCLUSION

As a result, the opinion that primary hypothyroidism in cats has gained more importance in veterinary endocrinology in recent years compared to previous years. We think that the evaluation of TT4, FT4 and TSH levels is of diagnostic importance in the diagnosis of feline hypothyroidism. Although hypothyroidism is rarely seen in cats, it should not be forgotten in the endocrinology of cats.

Conflict of interest: The authors declare that there is no actual, potential or perceived conflict of interest for this article

Project Support Information: During this study, any pharmaceutical company that has a direct connection with the subject of the research, a company that provides and/or produces pharmaceutical instruments, equipment and materials, or any commercial company, the evaluation process, the evaluation process, the material and / or morale that will negatively affect the result of the study. No support has been received.

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