

Clinical and laboratory features of 48 feline hyperthyroidism cases in Japan

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Abstracts

Feline hyperthyroidism (HT) is a common endocrine disorder worldwide, but clinical and laboratory features might vary geographically. The aim of this retrospective study was to evaluate feline HT in Japan, and compare results to those of previous study for feline HT. We evaluated 48 feline HT cases clinical and laboratory features. Surprisingly, the youngest patient was 32 months of age (2 year 9 months). There was no significant difference among the study subjects in sex, but frequency of spayed/castrated cats was high (85.4%). Median age was 186 months (32-272 months). 91.3% (n=42) of subjects were over 10 years of age, and 8.7% (n=4) were under 10 years of age. Clinical symptoms included vomiting, 56.3% (n=27); diarrhea, 2.1% (n=1); hyperactivity, 12.5% (n=6); emaciation, 41.7% (n=20); polyuria and polydipsia, 22.9% (n=11); chronic weight loss, 60.4% (n=29); and palpated enlarged thyroid, 2.1% (n=1). Concurrent findings included chronic kidney disease, 20.8% (n=10); congestive heart failure, 20.8% (n=10); tachycardia (over 240 beats/min), 18.8% (n=9); gallop rhythm, 31.3% (n=15); neurological disorders such as hind-limb paralysis, 14.6% (n=7); cystitis, 8.7% (n=4); gingivitis, 4.2% (n=2); diabetes mellitus, 4.2% (n=2); and arterial thromboembolism, 6.3% (n=3). In addition, laboratory features (complete blood counts and biochemistry) differed from those of previous reports in certain respects. Our results show that it might be important for practitioners to comprehend epidemiologic differences regarding feline HT worldwide.

Introduction

Feline hyperthyroidism (HT) is a multi-organ disease resulting from excessive circulating concentrations of L-tri-iodothyronine (T₃) and/or L-thyroxine (T₄).^{1,2} It is now accepted as the most common endocrine disorder in cats and the most important cause of

morbidity in middle-aged cats in the United States and the United Kingdom.¹⁻³ Feline HT is also commonly seen in Canada, Japan and New Zealand as well as other countries.⁴⁻⁶ This disease occurs in middle- to old-age cats, with a reported range of 4-22 years (median age approximately 13 years).⁷ Only 5% of feline HT patients are younger than 10 years at the time of diagnosis.⁷ Knowledge of worldwide variation in the characteristics of feline HT is limited.⁸ A report on prevalence among veterinary hospitals in North America suggested that there was a marked increase between 1979 and 1985.⁸ The average prevalence in 1979 was 0.3% in 1985, and that number had increased to 4.5%. Edinboro *et al.* reported that age-adjusted hospital prevalence increased from 0.1% in 1978-1982 to 2% in 1993-1997.⁹ An increase in hospital prevalence was also reported in Germany where the prevalence increased from 0.2% in 1987-1994 to 2.6% in 1998.¹⁰ Miyamoto *et al.* reported a prevalence of 8.9% in cats 9 years and older that were brought to hospitals in 2 areas in Japan,⁴ whereas Sassnau reported a prevalence of 11.4% among cats 8 years and older in an urban population in Germany.¹¹ Further, Wakeling reported a yearly incidence of 11.92% in a first opinion hospital in the United Kingdom.¹²

To date, the cause of the worldwide occurrence as well as the increase in prevalence has eluded scientists and it has been postulated that immunologic, infectious, nutritional, environmental, or genetic factors may play a role in the development of the condition.^{5,8,13-15} Further, the prevalence of feline HT varies worldwide. Thus, the characteristics of feline HT might differ according to location such as Europe, the United States, and other countries. However, to our knowledge, there has been only 1 report on feline HT in Japan. The purpose of this study was to describe the clinical signs and laboratory findings in 48 cats with HT in Japan.

Materials and Methods

Medical records of all cats with HT at Marble Veterinary Medical Center, Fujisawa, Kanagawa, Japan from June 2007 through May 2013 were retrospectively evaluated. The diagnostic work-up included a physical examination, complete blood count (Sysmex XT-1800IV, Kobe, Japan), and chemistry panel (DADE BEHRING Dimension X Pand Plus, Tokyo, Japan) to evaluate the general health status. Although occult feline HT accounts for approximately 10% of feline HT cases, we diagnosed feline HT by measuring the plasma T₄ concentration (ARKRAY SPOTCHEM Vidas SV-5010, Tokyo, Japan). The normal range of plasma T₄

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Key words: feline, hyperthyroidism, Japan, clinical, laboratory.

Contributions: the authors contributed equally.

Received for publication: 22 September 2013.

Accepted for publication: 7 December 2013.

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Veterinary Science Development 2014; 4:5080
doi:10.4081/vsd.2014.5080

is 9.0-44.9 nmol/L, and HT was diagnosed on the basis of a high resting serum T₄ concentration (>50 nmol/L). We did not examine by thyroid ultrasonography.

Results

Forty-eight hyperthyroid cats were retrospectively included in this study (Table 1). There were 19 castrated, and 4 intact male cats and 22 spayed and 3 intact female cats. Breeds included 40 domestic cats, 2 American short-hairs, 2 Chinchillas, and 2 Scottish Folds. Median body weight was 3.43 kg (range, 2.05-7.12 kg). Median age was 186 months (32-272 months). 91.3% (n=42) of subjects were over 10 years of age, and 8.7% (n=4) were under 10 years of age. Surprisingly, the youngest patient was 32 months of age. Body condition score (BCS) of the subjects according to a 5-point scale was as follows: 1 (n=1), 2 (n=23), 3 (n=15), 4 (n=8), and 5 (n=1).

Clinical symptoms (Table 2) included vomiting, 56.3% (n=27); diarrhea, 2.1% (n=1); hyperactivity, 12.5% (n=6); emaciation, 41.7% (n=20); polyuria and polydipsia, 22.9% (n=11); chronic weight loss, 60.4% (n=29); and palpated enlarged thyroid, 2.1% (n=1). Concurrent findings included chronic kidney disease (CKD), 20.8% (n=10); congestive heart failure, 20.8% (n=10); tachycardia (over 240 beats/min), 18.8% (n=9); gallop rhythm, 31.3% (n=15); neurological disorders such as hind-limb paralysis, 14.6% (n=7); cystitis, 8.7% (n=4); gingivitis, 4.2% (n=2); diabetes mellitus, 4.2% (n=2); and arterial thromboembolism, 6.3% (n=3).

The percentages of the subjects in which

Table 1. Clinical profile.

| | % | n. |
|----------------------|------|----|
| Sex | | |
| Male | 47.9 | 23 |
| Neutered | 82.6 | 19 |
| Intact | 17.4 | 4 |
| Female | 52.1 | 25 |
| Spayed | 92.0 | 23 |
| Intact | 8.0 | 2 |
| Breed | | |
| Domestic | 83.3 | 40 |
| Mix | 8.3 | 4 |
| A. shorthair | 4.2 | 2 |
| Chinchilla | 2.1 | 1 |
| Scottish | 2.1 | 1 |
| Age | | |
| under 10 years | 8.7 | 4 |
| over 10 years | 91.3 | 42 |
| under 5 years* | 2.17 | 1 |
| Body Condition Score | | |
| 1/5 | 2.1 | 1 |
| 2/5 | 47.9 | 23 |
| 3/5 | 31.3 | 15 |
| 4/5 | 16.7 | 8 |
| 5/5 | 2.1 | 1 |

*Excluded unknown age.

Table 2. Clinical symptoms.

| | % | n. |
|--------------------------|------|----|
| Vomit | 56.3 | 27 |
| Diarrhea | 2.1 | 1 |
| Hyperactivity | 12.5 | 6 |
| Emaciated | 41.7 | 20 |
| PU/PD | 22.9 | 11 |
| Weight loss | 60.4 | 29 |
| Renal disorders | | |
| Chronic kidney disease | 45.8 | 22 |
| Cardiovascular disorders | | |
| Congestive heart failure | 20.8 | 10 |
| Tachycardia* | 18.8 | 9 |
| Gallop rhythm | 31.3 | 15 |
| Neurological disorders | | |
| Spasm | 6.3 | 3 |
| Hind limb paralysis | 8.3 | 4 |

*Over 240 beats/min.

Table 3. Blood tests (abnormal range).

| | % | n. |
|--------------------------|------|----|
| Blood Cell | | |
| Erythrocytes | 20.8 | 10 |
| Leukocytes | 20.8 | 10 |
| Lymphocytes | 45.8 | 22 |
| Kidney | | |
| Blood urea nitrogen | 45.8 | 22 |
| Creatinin | 20.8 | 10 |
| Liver | | |
| Alanine aminotransferase | 52.1 | 25 |
| Aspartate transaminase | 50.0 | 24 |
| Alkaline phosphatase | 58.3 | 28 |
| Electrolytes | | |
| Sodium | 8.3 | 4 |
| Potassium | 33.0 | 16 |
| Chloride | 43.8 | 21 |

biochemical parameters were found to be elevated were as follows: alanine aminotransferase (ALT), 52.1% (n=25; normal range 34-107 U/L; aspartate aminotransferase (AST), 50.0% (n=24; normal range 0-42 U/L); alkaline phosphatase (ALP), 58.3% (n=28; normal range 0-58 U/L); blood urea nitrogen (BUN), 45.8% (n=22; normal range, 14-35 mg/dL); and creatinine, 20.8% (n=10; normal range 0.9-2.1 mg/dL).

Abnormal electrolyte and blood count results (Table 3) were found according to the following frequencies: sodium 8.3% (n=4; normal range 143-155 mmol/L); potassium 33% (n=16; normal range 3.6-5.6 mmol/L); chloride 43.8% (n=21; normal range 114-125 mmol/L); lymphocytes 45.8% (n=22; normal range 1500-7000/ μ L); leukocytes 20.8% (n=10; normal range 5500-19500/ μ L); erythrocytes 20.8% (n=10; normal range 550000-1000000/ μ L); and packed cell volume (PCV) 10.4% (n=5; normal range 32-45%). Virus tests revealed the following positive frequencies feline leukemia virus 0% and feline immunodeficiency virus 8.3% (n=4).

Discussion and Conclusions

In our study, there was no significant difference in sex among the subjects; however, 85.4% (n=41) of feline HT cases were castrated or spayed. This phenomenon is entirely different from that reported in the United States.¹ Thus, our findings suggest that a relationship might exist between sex hormones and HT.

A prevalence of feline HT of approximately 90% in cats over 10 years of age concurs with that in previous reports.^{1,2,4} Our results was similar to the previous reports.^{1,2,4}

An enlarged thyroid gland was palpated in only 1 case (2.1%). This finding was similar to that of the previous study in Japan,⁴ and was definitely lower than that of other report.^{1,2} However, we did not do thyroid ultrasonography, it might be overlooked the swelling of thyroid in feline HT. Gallop rhythm and tachycardia occurred less frequently and congestive heart failure more frequently compared with other reports.^{1,2} The percentage of patients with chronic weight loss was low in our study. Because there are few referral centers in Japan, most private hospitals might diagnose feline HT cases at first contact before marked weight loss has occurred. HT increases glomerular filtration rate, thereby complicating the diagnosis of CKD, and resulting in high prevalence of concurrent feline HT and CKD.² In our study, the frequency of concurrent was 20.8% at the diagnosis of feline HT, which concurs with that of previous study.² The frequency of urinary tract infection (such as cystitis) of 8.3% in our study, was slightly lower than

that of previous study (12%).³

Results of hematologic testing revealed lower prevalence of abnormal PCV and leukocytes results compared with previous studies.^{1,2} Prevalence of abnormal (AST, ALT and ALP) findings were also lower in our study.^{1,2} In contrast, the frequency of abnormal BUN level was higher than that of previous studies.^{1,2} All of our study results regarding sex, age, and clinical and laboratory findings differed slightly from those reported in the United Kingdom.³

There is only 1 report published in 2002 on feline HT in Japan, in which Miyamoto *et al.* described the prevalence and clinical and laboratory features of feline HT.⁴ They reported high ALT and ALP levels, and elevated heart rate in feline HT. We could not compare our results with those in this report, because the percentages of each parameter in feline HT cases were not shown. However, clinical and laboratory findings might differ among regions in the same country, because the regions in their study were distant to our region about 500 km.

A limitation of our study was that we only used plasma T4 for diagnosing feline HT; this means that approximately 10% of feline HT (mild or occult HT) cases were excluded. However, clinical and laboratory features of feline HT might be different in Japan compared with previous studies.^{2,3} Our results show that it might be important for practitioners to comprehend epidemiologic differences regarding feline HT worldwide.

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