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Feline Hyperthyroidism

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KEY POINTS

Feline hyperthyroidism is a common senior cat disorder. Recent work has shed light on the aetiology and pathogenesis of hyperthyroidism. The diagnosis is generally straightforward though difficulty can occur in evaluating thyroid status in cats with concurrent illness. Many treatment options exist and therapy just be tailored to the individual patient. In some cases, watchful waiting may be the most appropriate treatment option.

Aetiology

1. Thyroid adenoma or adenomatous hyperplasia
2. 80 % are bilateral on presentation
3. 1-2% due to thyroid carcinoma
4. Aetiology unknown

One recent study showed that cats that preferred fish or liver and giblets flavours of canned cat food had an increased risk of hyperthyroidism. Another case controlled study showed that cats that used litter or were treated with topical ectoparasite preparations had an increased risk of developing hyperthyroidism. Compared with cats that did not eat canned food, those that ate commercially prepared canned food had an approximate 2-fold increase in risk of disease.

Oncogenes and the tumor suppressor gene p53 examination showed overexpression of c-Ras protein in thyroid adenomas but no staining for either Bc12 or p53 in any of the cats. These results indicated that overexpression of c-ras was highly associated with areas of nodular follicular hyperplasia/adenomas of feline thyroid glands, and mutations in this oncogene may play a role in the etiopathogenesis of hyperthyroidism in cats.

Signalment

1. No sex or breed predilection
2. Average age 13 years
3. Age range (4)-6-20-(24) years

Clinical signs

1. Weight loss
2. Polyphagia
3. Polydipsia
4. Diarrhea
5. Hyperactive
6. Vomiting
7. Bulky, foul smelling stool
8. In about 10% of cats, apathetic hyperthyroidism is seen with clinical signs dominated by extreme lethargy and weakness, weight loss with anorexia, and cardiac abnormalities

Many cats are now asymptomatic at the time of diagnosis due to the increased screening of senior cats with TT4 levels.

With time we have seen both an increase in the diagnosis of hyperthyroidism as well as a decrease in the severity of the clinical signs associated with thyrotoxicosis. This is most likely due to an increased awareness on the part of the pet owner and the veterinarian as well as the increased use of T4 concentrations as an integral part of routine feline health screening.

Physical examination

1. Palpable thyroid gland(s). Normal thyroids can not be felt.
2. An enlarged gland may be found at the thoracic inlet

3. Cardiac examination:
 - Tachycardia > 220 Beats/Min
 - Murmurs. Be sure to listen over the sternum
 - Gallop rhythms
4. Dehydration/emaciation
5. Small kidneys
 - Common in older cats
 - Renal disease and hyperthyroidism both cause PU / PD
 - Will need to monitor renal function to differentiate the two

Over the last ten years with increased awareness of the disease and the ease of diagnosis the clinical signs have become less dramatic as more cats are diagnosed and treated earlier.

Differential Diagnosis

1. Diabetes mellitus
2. Renal disease
3. Liver disease
4. Heart disease
5. Gastrointestinal disease
 - Pancreatic exocrine insufficiency
 - Inflammatory bowel disease
 - GI lymphosarcoma

Laboratory Abnormalities

1. PCV and RBC may be increased due to dehydration
2. Urinalysis
 - Decreased concentrating ability
 - Presence of concurrent renal disease
3. Serum biochemistry profile
 - Elevated AP, ALT (50-75%)
 - a. Liver function is normal
 - b. Will decrease following treatment
 - Elevated urea and creatinine (30-40%)
 - a. Most are increased secondary to dehydration
 - b. Will need to be re-evaluated post-treatment as up to 5% of cats treated for hyperthyroidism (any form of therapy) will develop progressive renal insufficiency
 - Hyperphosphatemia (20%)
 - a. Felt to be due to increased bone turnover

Fructosamine

Concentrations of serum fructosamine are lower in cats with hyperthyroidism independent of blood glucose concentrations. In the clinical setting this means that serum fructosamine concentration should not be used to initially diagnose or assess the adequacy of diabetic control in cats with concurrent hyperthyroidism in which the hyperthyroidism has not been controlled for at least six weeks.

Cardiac Evaluation

Important to assess in animals with clinical signs or abnormalities on physical examination prior to deciding on optimal therapy and to differentiate thyrotoxic heart disease from the two primary feline myocardial diseases, hypertrophic and dilated cardiomyopathy.

3. Radiographs
 - 20-30 % have cardiomegaly
 - < 5 % show signs of failure (pleural effusion, oedema)
2. EKG
 - Tachycardia and increased R wave amplitude the most common abnormalities
3. Ultrasound
 - The best way to differentiate between primary and secondary cardiac disease

Diagnosis

1. Elevated T4 concentration. Measurement of T3 of little help.
2. May be able to palpate a thyroid nodule before the T4 is elevated. Recheck T4 every 3-6 months or when signs occur.

3. Occasionally cats with hyperthyroidism may have a T4 in the normal range at the time of sampling. This is especially true in cats with mild hyperthyroidism. A second sample may be needed in those cats with strong clinical evidence of thyrotoxicosis. The second sample should be taken a few days to weeks later, as more pronounced fluctuations in thyroid hormone levels occur over days rather than hours. Non-thyroidal illness may also result in high-normal serum T4 concentrations even in the face of hyperthyroidism. Following correction of the underlying illness or discontinuation of medications, T4 levels will increase into the hyperthyroid range.

In animals in which hyperthyroidism is suspected, but the basal T4 levels are consistently normal, four additional tests can be considered.

1. T3 Suppression Test
 - a. Basis of the Test: The normal pituitary-thyroid axis will be suppressed following supplementation with T3. A decrease in TSH concentration will lead to a decrease in T4 levels.
 - b. Performing the Test
 - i. Determine basal T4 level
 - ii. Administer T3 (25 ug) every 8 hours for two days, giving the last dose on the morning of day 3
 - iii. Determine T3 and T4 concentrations 4 hours following the last dose of T3
 - iv. Normal cats:
 - a) T4 levels suppress greater than 50% from pre-treatment value
2. TRH Stimulation Test
 - a. Basis of the Test: TRH is the hypothalamic peptide that regulates TSH release from the pituitary. TSH response to TRH is blunted in patients with hyperthyroidism.
 - b. Performing the Test:
 - i. Obtain basal T4 level
 - ii. Administer 0.1 mg/kg TRH IV
 - iii. Obtain 4 hour post TRH T4
 - iv. Normal cats:
 - a) Two-fold rise in T4 post TRH
 - b) Hyperthyroid cats have minimal to no increase in T4
3. Free T4
 - a. In cats where the TT4 is in the upper 50% of the basal resting range, an elevated fT4ED in the face of clinical signs is highly predictive of hyperthyroidism. Use of fT4ED should not be used as the initial screening test as some euthyroid senior cats have elevated fT4ED. Due to the simplicity of the test, fT4ED should be the first line test in diagnosing cats with hormonally occult (normal TT4) hyperthyroidism.
4. Imaging
 - a. Technetium scans may be helpful in hormonally borderline cases where bilateral uptake is clearly increased or unilateral disease is present.

Treatment

A. Surgery

1. A number of articles have been written on the technique
2. Thyroid scans, if available can be very helpful to the surgeon:
 - a. Identify unilateral vs bilateral disease
 - b. Identify ectopic or metastatic thyroid tissue
3. A number of important points to be remembered are:
 - a. Treat the hyperthyroidism medically for 4-6 weeks prior to surgery. These cats are anaesthetic risks until euthyroid.
 - b. All abnormal thyroid tissue should be removed. If thyroid scanning is not available and at the time of surgery you can see both thyroid glands, remove both of them. Normal thyroid tissue would have atrophied due to the increased level of T4
 - c. Some clinicians have advocated staged thyroidectomies though no studies have been published. Staged procedures should decrease the risk of hypoparathyroidism but they may also result in the need for a second surgical procedure to correct recurrent hyperthyroidism.
4. Disadvantages of surgery
 - a. Poor surgical risk due to concurrent illnesses
 - b. Potential for iatrogenic hypoparathyroidism, Horner's syndrome, laryngeal paralysis
5. Advantages of surgery
 - a. Relatively inexpensive
 - b. Surgical procedure is not difficult

6. Post-surgery
 - a. Do not get overzealous with fluid therapy
 - b. If bilateral thyroidectomy, measure serum calcium once daily for 7 days
 - c. Signs of hypocalcemia include facial muscle twitching, ear twitching, rubbing of the face, generalized muscle fasciculations, and seizures
 - d. Therapy for hypocalcemia
 - i. DHT (Dihydrotachysterol) 0.03 mg/kg daily
 - ii. Ca gluconate tablets (1-3/day)
 - iii. For acute hypocalcemic tetany:
 - a) 1 cc/kg of calcium gluconate (10%) IV slowly over 10-20 minutes
 - b) EKG monitoring advisable
 - c) Do not use calcium chloride
 - iv. Also consider using 5-15 ng/kg of calcitriol once a day for vitamin D supplementation

B. Anti-thyroid medications

1. Medications include methimazole or carbimazole (a pro-drug to methimazole)
2. Act by blocking intrathyroidal conversion of iodothyronines into T3 and T4
3. Animals developing side-effects to one of these medications should not be treated with the other as cross-sensitivity can occur. Side-effects with methimazole usually occur within the first month of therapy and include GI upset (anorexia and vomiting are the biggest problems), facial scratching and agranulocytosis. Reactions usually subside within 2 weeks after stopping medication.
4. Most gelenic forms are oral, but transdermal patches are available in some countries.
5. Advantages of medical therapy
 - a. Inexpensive (in the short term)
 - b. Simple and effective
6. Disadvantages
 - a. Owner compliance
 - b. Side-effects (anorexia in up to 15%)
7. Other medications:
 - a. Atenolol
 - i. Beta blocker used to slow heart rate
 - ii. 6.25-12.5 mg q12h
 - iii. Use with methimazole or carbimazole
 - iv. Used primarily for short term stabilization prior to definitive therapy

C. Radioactive Iodine

1. Thyroid concentrates iodine and radioactive iodine will destroy the functioning thyroid cells without destroying non-thyroidal tissue or normal suppressed thyroid tissue.
2. Advantages
 - a. 95% effective
 - b. No problem with parathyroid gland function
 - c. No anaesthesia, no surgery, no pills
 - d. T4 normal in 7-10 days
3. Disadvantages
 - a. Requires referral centres capable of handling I131
 - b. Cat needs to be hospitalized while radioactive (depending on laws, 3 days to 4 weeks)
 - c. Fixed dose therapy has allowed for greater use

Recently, ethanol ablation of thyroid adenomas has been reported. Results are preliminary but treatment was successful in eliminating clinical signs and lowering TT4 levels. This option may be used more frequently in the future as experience with the technique increases.

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