Feline Hyperthyroidism:

Current treatment options and the role of the Veterinary Nurse

Abstract

Feline hyperthyroidism (FH) is the most common endocrinopathy in older cats but is still underdiagnosed. Since the first reported case prevalence has continuously increased. In the UK general practitioners rely mostly on medical management. Recent studies show that the prevalence of carcinoma rises from approximately 2 to 20% following long-term medication. The life expectancy is double with radioiodine treatment compared with medication. Radioiodine is now more available in the UK than at any time both in the number of centres and the reduction in the minimum hospitalisation period to only 5 days. The veterinary nurse has a key role to play in educating cat owners of clinical signs to aid early diagnosis, helping explain treatment choices and in supporting long-term management of this growing patient group.

Key words

Feline hyperthyroidism, evidence-based medicine, cure, carcinoma

Introduction

Feline hyperthyroidism has become the most common endocrine disorder in older cats (mean 13 years of age, range 4 to 20 years of age (Nelson, 2007)) since the first case was described in 1979 (Peterson et al, 1979). The most recent epidemiological survey reported a prevalence of 21% of 508 cats 10 years of age or older in the greater Dublin area, Ireland (Gallagher and Mooney, 2013). Pedigree cats are underrepresented and there is no gender bias (Nelson, 2007). Feline hyperthyroidism is the result of over-production of thyroxine by one or more tumours of thyroid tissue. The normal feline thyroid gland is composed of two lobes located laterally on either side of the proximal trachea. Rarely, ectopic thyroid tissue can arise from the base of the tongue to the mediastinum (Patnaik et al., 2000). The loose attachments to the trachea allow enlarging adenomas or carcinomas to reach and enter the cranial thoracic inlet as a result of the effect of gravity. Most tumours are benign adenomas, with carcinomas accounting for fewer than 2% of cases (Peterson and Broome, 2014). However, a recent study of 2,096 hyperthyroid cats referred for radioiodine treatment has suggested that this prevalence can reach 19.3% in cats treated with oral methimazole for 4 or more years (Peterson et al, 2015). The authors concluded that their study provides evidence that feline hyperthyroidism is a condition that progresses over time, with enlargement of tumours and transformation to malignancy, which cannot be arrested by medical management. The role of methimazole in this process, if any, requires further study. However, they acknowledged that their study population may not be representative of the whole population of cats managed with methimazole.

Benign adenomas vary in size from 1 mm to 30 mm, sometimes showing extensive cystic change (Figure 1), and between 70 and 75% of cases are bilateral. The potential for mediastinal thyroid tissue, and for cervical thyroid tumours to reach appreciable size and gravitate through the cranial thoracic inlet, accounts for between 2 and 20% of cases having ectopic tumours within the thoracic cavity (Hibbert et al., 2009; Peterson and Broome, 2014). Clinical signs of thyrotoxicosis include weight loss, polyphagia, tachycardia, palpable goitre, polydipsia and polyuria, diarrhoea and vomiting. Secondary changes commonly encountered include hepatopathy, secondary left ventricular hypertrophy and behavioural changes including restlessness and aggression. However, these changes are not readily apparent in the

early stages and feline hyperthyroidism is a condition frequently underdiagnosed with up to 10% of older cats *subclinically* hyperthyroid (Gallagher and Mooney, 2013; Sparkes, 2012). Left untreated, hyperthyroidism will shorten lifespan through congestive heart failure, thromboembolic disease, starvation, behavioural change (such as accidental injuries resulting from extreme restlessness) or from other causes. A palpable goitre is observed in most cases, but this is not pathognomonic of feline hyperthyroidism (Norsworthy et al 2002). Feline hyperthyroidism is more likely as the size of the goitre increases (Boretti et al., 2009), and with practice good correlation between observers can be achieved (Paepe et al, 2008). A straightforward diagnosis can be confirmed by demonstration of total T4 above normal range. Some diagnoses may rely on demonstration of free T4 above normal range, when total T4 is in high euthyroid (normal) range. Severely depressed levels of thyroid stimulating hormone can support a diagnosis of feline hyperthyroidism, but this is not yet validated in the cat (Peterson, 2013). Specialist imaging including scintigraphy and ultrasound are useful but not commonly used (Broome, 2006; Barberet et al, 2010). Fine-needle aspirate biopsy can be mis-representative since both benign and malignant tumours can be found in the same thyroid lobe (Hibbert et al, 2009).
The focus of the remainder of this article is on current treatment options and the role of the veterinary nurse.

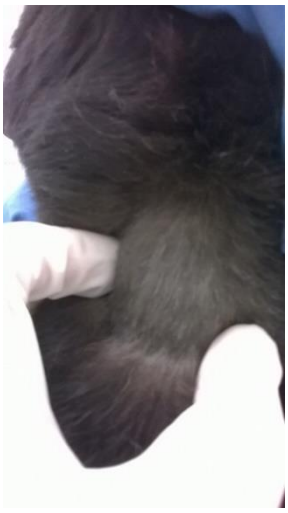
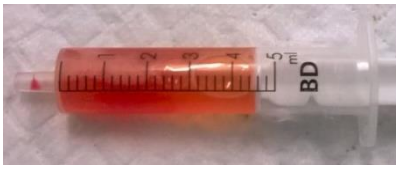


Figure 1a. Benign adenomas can become cystic; the substantial right goitre in the ventral neck was well circumscribed; aspiration confirmed straw-coloured fluid content (Figure 1b). ©The Hyperthyroid Cat Centre, 2014



Treatment Options

The goal of treatment is to return the hyperthyroid patient to euthyroidism and this is achieved either by the curative methods of radioiodine or surgery, or the lifelong control of thyroxine overproduction by using either oral or transdermal medication, or by severe restriction of dietary iodine. These treatments (and others) are summarised in Table 1 and are discussed in turn.

Table 1. Treatments for feline hyperthyroidism available in the UK, or discussed in the literature

Management

Iodine-restricted diet

- Hill's y/d dry iodine concentration 0.19 ppm
- Hill's y/d wet iodine concentration 0.14 ppm
- *(For non-hyperthyroid cats a concentration of between 0.5 and 2 ppm has been suggested (Peterson, 2012a))*

Medication – oral (66.7%)

- Thiamazole – available as Felimazole, 1.25mg, 2.5mg, 5mg (Dechra Veterinary Products)
- Carbimazole – available as Vidalta, 10mg, 15mg (MSD Animal Health), or off-license as Neo-Mercazole, 5mg (Amdipharm Mercury Company Ltd)
- Thiamazole - Available as Thiafeline, 2.5mg, 5mg, blister pack formulation (Animalcare)
- *(Thiamazole, also known as methimazole, is the active ingredient in all cases (as administered or after metabolism) so that any side effects encountered with one drug are likely to be repeated with another).*

Medication – transdermal

- Methimazole – available off-license as Methimazole Transdermal Gel, 5mg/0.1ml, 1ml syringes (Summit Veterinary Pharmaceuticals)

Cure

Thyroidectomy (27.5%)

- Uni or bilateral, single procedure or staged, thoracotomy required for intra-thoracic ectopic

Radioiodine (5.5%)

- Single or double-dose treatment
- High-dose treatment for thyroid carcinoma

Other (1.3%)

Described in the literature include:

- Homeopathy – one report claims successful resolution of clinical signs in a series of 4 cases (Chapman, 2011)
- Ultrasound-guided heat ablation – one study of 9 cats found this an effective temporary treatment with total T4 returning to reference range (Mallory et al, 2003)

Figures in brackets indicate the % of UK veterinary surgeons preferring each treatment (Hills y/d was not available at the time of this survey) (Higgs et al, 2014). Some preparations are not licensed for veterinary species and the responsibility to comply with the dispensing cascade lies with the prescribing veterinary surgeon

Iodine-restricted diet

Available in the UK since 2011, Hill's y/d remains the only commercially available restricted-iodine diet for cats. Iodine is an essential component of thyroid hormones and by severely restricting availability this diet prevents overproduction. After transitioning to the diet 64% of cats are euthyroid after 4 weeks, 75 % after 8 weeks (van der Kooij et al, 2014) and 90% after 12 weeks (Melendez, 2012). However, most cats find y/d unpalatable so that for 75% of cases this diet is not an effective option (van der Kooij et al, 2014). The manufacturers claim a new formulation in 2013 has improved palatability (Hill's Pet Nutrition Ltd, 2013). Best results are obtained when y/d is eaten exclusively for the remainder of the cat's life. However, cats with potential access to iodine sources other than restricted-iodine diet, by having uncontrolled access to the outdoors, also became euthyroid in a recent study (van der Kooij et al, 2014). The suitability of this diet for the long-term nutritional needs of older cats has been questioned (Peterson, 2012b), concerns citing its dependence on carbohydrates and low energy density, making maintenance of body muscle mass difficult in the older cat (see below). The long-term effect of an iodine deficient diet on aspects of physiology other than thyroid hormones is not fully understood. It has been suggested that the high demand for iodine by thyroid tumours may make hyperthyroid cats relatively iodine deficient. For example, stomatitis has been observed in hyperthyroid cats with resolution once euthyroidism is achieved, suggesting that iodine may play a part in maintaining oral health as a constituent of saliva. (Peterson, 2012b). However, there are patients for which Hill's y/d may be the most appropriate option, such as the drug-intolerant or difficult to medicate cat for whom surgery and radioiodine are excluded for reasons of cost, availability or clinical suitability (see below).

Medication

Medication is most appropriate when a curative option is not available or appropriate, or if a reversible option is preferred such as for a cat with concomitant advanced renal disease. Methimazole (also known as Thiamazole) is the active ingredient provided directly, or after metabolism, by currently available medications (Table 1). Some preparations are not licensed for veterinary species and the responsibility to comply with the dispensing cascade lies with the prescribing veterinary surgeon. By blockading thyroid peroxidase, methimazole prevents thyroglobulin and dietary iodine combining, a key step in the production of thyroxine. However, the underlying tumour remains unaffected. Euthyroidism is achieved in approximately 80% of new cases within 3 weeks, but although mean total T4 is within euthyroid range for the test population, individuals are often over- or under-treated (Peterson et al, 1988). The prevalence of carcinoma has been shown to rise from 2 to 20% after prolonged thiamazole use (Peterson and Broome, 2012) and this is one factor making medication less suited to a newly-diagnosed younger cat. Side effects are frequently encountered and although many can be managed some can be fatal (Table 2). Most side effects are reversible within 6 weeks of medication being withdrawn (Peterson et al, 1988). It has been shown that as few as 75% of cat owners are able to medicate their cat consistently (Caney, 2013) and this, together with the prevalence of adverse effects, have been suggested as an explanation for the life expectancy of medicated cats being half that of those treated with radioiodine (Milner et al, 2006). A recent survey reported that 98% of UK veterinary general practitioners regarded owner compliance with medication as "important" or "very important" (Table 3) (Higgs et al, 2014). For clients, sometimes overlooked is the potential hazard in handling these drugs. Methimazole is a potential teratogen and gloves should be worn when handling medication or the litter tray. One drug manufacturer produces a blister-pack of thiamazole product to reduce direct handling of the drug (Thiafeline, Animalcare).

Off-license, methimazole is also available in the UK as a transdermal gel (Summit Veterinary Pharmaceuticals) and as well as improving the reliability of medication compared with oral formulations some side effects such as vomiting and diarrhoea are reported much less frequently. Pinnal dermatitis (at the application site) can be encountered. However, although effective in keeping the *mean* total T4 within euthyroid range for a population of hyperthyroid cats, individuals commonly are either under- or over-treated (Boretti et al, 2014).

Table 2. Reported adverse effects to oral methimazole in a clinical trial, and experientially amongst UK general practitioners

Of 262 cats, typically within the first 1-2 months of starting oral medication, adverse effects were observed in the % of cats shown (Peterson et al, 1988):		In a survey of 603 UK general practitioners, within the previous 12 months the following side effects were observed by the % of vets shown (Higgs et al., 2014):	
18.1	Anorexia	69	vomiting
	Vomiting	47	anorexia
	Lethargy	44.8	facial pruritus
	Excoriation of face and neck	22.7	azotaemia
	BLEEDING	11.8	**ANAEMIA**
	hepatopathy	10.9	**LEUKOPENIA**
16.4	eosinophilia	9.6	**HEPATIC DAMAGE**
	Lymphocytosis	8.4	**NEUTROPENIA**
	Leukopenia **(IF SEVERE)**(if mild)	8.4	**THROMBOCYTOPENIA**
3.8	Agranulocytosis	4.7	lymphadenopathy
	THROMBOCYTOPENIA	0.9	sudden death
21.8	Antinuclear antibodies (significance uncertain)	General awareness of the prevalence of these adverse events would be enhanced by improved participation within the VMD pharmacovigilance scheme. The GPs reported at the following frequencies:	
1.9	**RED CELL AUTOANTIBODIES**		
		49.6% never reported adverse event	
		36.5% reported up to 25% of adverse events	
		8% reported 26 – 99%	
		5.9% reported 100%	
Recommended clinical response: red discontinue methimazole permanently – **BOLD BLOCK CAPITALS** are life threatening; blue monitor (**BOLD BLOCK CAPITALS** may become life threatening, green try lower dose and continue if tolerated.			

Surgery

Thyroidectomy can be a successful curative option when radioiodine is unavailable (Naan et al, 2006). Surgery is the only treatment method from which meaningful biopsies can be obtained. Cats without a palpable goitre or poor anaesthetic or surgical risks are not suitable for surgery. Challenges for the anaesthetist include those associated with the older age group typical of hyperthyroid cats, often with a combination of poor body condition score and tachycardia with secondary left ventricular hypertrophy. Hypo and hyperkalaemia are both associated with hyperthyroidism. Medication with methimazole pre-surgery can help to reduce anaesthetic risk. In cats intolerant of methimazole, or when tachycardia

persists despite use of methimazole, beta-blockers also help to reduce anaesthetic risk (Naan et al, 2006). For the surgeon, challenges include the difficulties of visualising micro-adenomas, and removing the entire tumour (whether adenoma or carcinoma) to prevent recurrence whilst avoiding iatrogenic damage to adjacent parathyroid glands. Parathyroid glands form part of the mechanism achieving calcium homeostasis and, if damaged, hypocalcaemia can occur usually within 72 hours of bilateral or second thyroidectomies. If unrecognised and untreated, hypocalcaemia can be fatal. Clinical signs of hypocalcaemia include reduced appetite, depression, weakness and twitching, progressing to tetany and seizures. Clinicians commonly hospitalise cats for several days post bilateral or second thyroidectomies using periodic blood testing and clinical observation to detect falling blood calcium. Treatment aims to achieve immediate correction of the deficiency and then medium-term supplementation with a combination of oral calcium and vitamin D (to aid absorption). Long-term supplementation is only rarely required. Ectopic (intra-thoracic) thyroid tumour can be another reason for surgical failure. Different techniques have been described aiming to overcome the challenges listed above (Flanders, 1999). These include staged surgeries (meaning that in cases of bilateral thyroid tumour the second unilateral thyroidectomy is undertaken often several weeks after the first), intra-capsular techniques (to reduce the risk of parathyroid damage by incising the capsule enclosing the thyroid lobe, to avoid damaging adjacent parathyroid tissue) and extra-capsular techniques (to avoid retention of thyroid tumour cells by removing the thyroid lobe within its capsule).

Table 3. Client and veterinary surgeon concerns in selecting radio-iodine, and a long-term treatment plan for feline hyperthyroidism, respectively

Client concerns ranked from 1 (least) to 10 (most) (Boland et al, 2014)		% of UK GP vets reporting the stated concern as "important" or "very important" when devising long-term treatment plans (Higgs et al, 2014)	
7	Hospitalisation period	98.0	Owner compliance with medication
3	Side effects to the cat following RIT	97.7	Ease of drug administration
2	Travel to radioiodine centre	96.5	Co-morbid disease
1	Health risks to themselves	80.9	Cost of treatment
1	Waiting period for referral	78.6	Cost of monitoring
1	Cost of radioiodine	76.3	Risk of surgical complications
		66.7	Age
		65.3	Risk of drug side effects
		48.1	Ease of referral for RIT
		30.5	Whether cat is insured
		19.7	Indoor vs outdoor

Radioiodine

Radioiodine is the treatment of choice in most cases, especially the newly-diagnosed (Daniel and Neelis, 2014; Nelson, 2007; Peterson, 2006; Peterson and Becker, 1995). Cases requiring intensive nursing care or other clinical support may not be suitable if staff radiation safety would be compromised (see below). Sodium iodide 131 is a dual-emitter of both ß and ϒ radiation, and is administered usually as a subcutaneous injection (Peterson and Becker, 1995; Theon et al, 1994). Once administered it follows the same physiological pathway as dietary iodine. The normal production of thyroxine requires stimulation of the thyroid gland by thyroid stimulating hormone (TSH), produced by the pituitary. Increasing thyroxine levels result in a reduction in TSH levels by a negative feedback loop, thereby achieving homeostasis. Thyroid tumour tissue produces thyroxine to excess *without* requiring

stimulation by TSH. The above-normal thyroxine levels that result suppress TSH *below* the level needed to stimulate normal thyroid tissue and disuse atrophy results. The atrophied normal thyroid tissue usually takes up insignificant amounts of iodine, and when radioiodine is administered to uncontrolled hyperthyroid cats it is this which usually prevents ablation of normal thyroid tissue. Once taken-up by the thyroid tumour (at whatever location) the ß radiation causes severe damage to cells within a radius up to 0.5 mm. It is this very short path length which prevents iatrogenic hypoparathyroidism from occurring. Most tumour cells are destroyed but some are only damaged, prevented from being able to divide but still functional until apoptosis (normal cell death). Most cats become euthyroid within one to three weeks of radioiodine treatment (RIT) but the full effect is not seen in every case until up to six months later. At the end of this period approximately 95% of cats are permanently cured, with de novo episodes of hyperthyroidism affecting approximately 2% with a mean interval of 3.4 years. Approximately 1.5% of cases are still hyperthyroid 6 months post RIT and most of these respond to a second treatment (Peterson and Becker, 1995). Thyroid carcinoma is suspected in hyperthyroid cats unresponsive to two treatments. Approximately 2.1% of cats require lifelong supplementation with oral thyroxine following iatrogenic hypothyroidism (Peterson and Becker, 1995) (TABLE 4). Recovery of atrophied normal thyroid tissue can take a period of weeks to months and hypothyroidism can be encountered immediately following RIT, resolving in most cases. Persistent hypothyroidism results either from inadvertent ablation of normal thyroid tissue, or failure of atrophied normal thyroid tissue to resume normal function. In cats RIT has no side effects other than iatrogenic hypothyroidism. However, the ϒ-radiation from iodine 131, which has the same characteristics as X-ray radiation, creates substantial radiation safety challenges for staff and cat owners. For this reason cats are commonly sedated for treatment, and specialist hospitalisation is required before cats can be returned to their owners. In the UK cats can return home from five days after treatment although the minimum period varies between centres. Pre-RIT screening intends to avoid either patient welfare or staff safety being compromised if close handling of a radioactive cat was required, for example following progression of significant concomitant disease. Pre-RIT protocols vary between centres. Cases with life-threatening concomitant disease such as congestive heart failure may therefore be unsuitable for RIT, whilst non-critical illnesses may be managed and RIT provided when resolved or stable (Puig et al, 2015). Minimising the hospitalisation period is significant as a cat-owner survey highlighted this as the biggest concern when considering RIT (TABLE 4, FIGURE 2) (Boland et al, 2014).

Table 4. Outcome data from 524 hyperthyroid cats treated with radioiodine

- 84.7% become euthyroid within 25 days (mean 9.5 days)
- 13.8% are delayed responders remaining initially hyperthyroid, but euthyroid by 6 months
- 1.5% remain hyperthyroid at 6 months
  - most respond to a second treatment
  - suspect carcinoma if still unresponsive
  - radioiodine treatment of choice for carcinoma, but at high dose
- 2.1% required supplementation with thyroxine, if clinically hypothyroid (excessive weight gain, matted coat, personality changes – can become subdued/withdrawn), or if concurrent azotaemia *nb: life expectancy reduced by half if this group are not diagnosed and treated* (Williams et al., 2010a).

Of those cured, approximately 2.5% show future de novo hyperthyroidism (mean 3.4 years)
Summary: 94.2% cure rate, occasional thyroxine supplementation required and occasional non-responders.

Providing cat-friendly accommodation with appropriate behavioural enrichment is key in managing cat needs and client concerns (FIGURE 3).

Figure 2. The period of separation during RIT is the biggest concern for prospective clients. ©The Hyperthyroid Cat Centre, 2014

Figure 3. Environmental enrichment is important to clients and cats alike. ©The Hyperthyroid Cat Centre, 2014.

Post-treatment Nutrition

In addition to treating hyperthyroidism consideration should be given to appropriate dietary management. The normal ageing process includes loss of muscle mass (sarcopenia of ageing) after 12 years of age (to the extent that 15 year-olds may have one third less muscle mass than 7 year-olds), an increase in energy requirements above 11 years of age and a reduced ability to digest protein. Most hyperthyroid cats are over 10 years of age and their increased metabolic rate compounds normal ageing change. As obligate carnivores, 40 – 60% of dietary energy must be supplied as protein to prevent the cat's own protein being consumed (Peterson and Eirmann, 2014).

Chronic renal disease (CRD) is commonly encountered in older cats (Williams et al, 2010a) and is more common in hyperthyroid cats (30% of hyperthyroid cats with mean age 12-13 years of age) than in euthyroid cats (Williams et al, 2010b). It is now understood that hyperthyroidism hastens the progression of renal disease (Higgs et al, 2014), hence the value of achieving stable permanent euthyroidism soon after hyperthyroidism is diagnosed. Cats with CRD often have elevated serum phosphorous levels and managing this often relies upon reducing dietary protein. Paradoxically this restriction of dietary protein compounds normal ageing changes and worsens the catabolism of hyperthyroidism.

It is also known that a proportion of hyperthyroid cats show pre-diabetic change including insulin resistance and mild hyperglycaemia, for which a diet where < 10% of energy is provided by carbohydrates is advised. Given that up to 50% of energy will then be provided by fat, care must be taken to avoid obesity which again predisposes to diabetes. Cats with advanced CRD will require phosphate restriction and this can be difficult to achieve whilst maintaining energy intake in the proportions recommended above, and dietary phosphate binders may be required.

Risk factors for the development of feline hyperthyroidism

Currently the aetiology of feline hyperthyroidism is poorly understood. Epidemiological studies and others have suggested an association of feline hyperthyroidism with the feeding of canned cat food, inappropriate or inconsistent concentrations of dietary iodine, exposure to goitrogens [such as bisphenol A (found in some packaging such as cat food tins), isoflavones (a component of soy protein, used as a cheaper protein source in some cat foods) and flame retardants], the use of litter trays, herbicides and some ectoparasiticide spot-on's (Peterson, 2012a). Genetic predisposition has also been suggested (Kass et al., 1999). However, recent work sponsored by a pet food manufacturer challenges the associations described above, as there is limited evidence of causation (van Hoek et al, 2014).

Table 5. Feline hyperthyroidism: suggested prevention strategies

Diet

- Avoid feeding soy protein (present in many cat foods).
- Minimise the feeding of fish.
- Avoid feeding food with giblet flavours.
- If feeding moist food, use pouches.
- If the preference is for canned food rather than pouches, avoid using larger cat food cans such as 156g. Instead, plan to use smaller ones such as 85g.
- Avoid extremes of iodine concentration in food, and avoid wide fluctuations in iodine concentrations between different diets. The recommended concentration is 0.5 – 2ppm.
- Ensure that the diet has a recommended balance of vitamins and minerals, especially vitamins A and D, and selenium.
- Consider home cooking to avoid potential contaminants – but see a veterinary nutritionist.
- Avoid using plastic containers for feeding or storage or heating. Avoid using cling film over food. Instead use ceramic or glass containers.

Drinking Water

- Consider using a quality filter on tap water to exclude contaminants.
- Avoid bottled or demineralised water.

Cat Litter

- If using cat litter, choose natural biodegradable cat litters.
- Avoid cat litter that contains chemicals such as deodorisers.

Packaging

- Be aware that fire retardants can become accessible to cats, for example when foam packing or mattresses becomes aged and the covering is damaged. Try to minimise this exposure.
- Avoid products, where possible, that make use of bromine-based fire retardants.

Environment

- Damp-dust the cat's coat daily.
- Bathe the cat monthly.
- Minimise house dust by vacuum-cleaning frequently, with an integrated HEPA filter.
- Use a HEPA air filter in the home.
- Use topical and environmental flea products sparingly.
- Minimise use of environmental chemicals in the home.

Based on Peterson, 2012

Some suggested strategies to limit the risk factors for feline hyperthyroidism have been proposed (Table 5) and although it is not known whether they will have any benefit they are unlikely to be harmful and are based on current thinking (Peterson, 2012a).

The Role of the Veterinary Nurse in Feline Hyperthyroidism

Feline hyperthyroidism is the most common endocrinopathy in older cats, but is still underdiagnosed. The role of the veterinary nurse impacts at all stages:

1. They can improve awareness among cat owners using newsletters, waiting room displays and website links.
2. Geriatric clinics provide an excellent opportunity to detect trends of falling bodyweight, falling body condition score, loss of muscle mass, rising heart rate and hypertension. Routine palpation of the region of the thyroid gland, with practice, will facilitate early detection of a potential goitre (Peterson, 2013). Cat-owner observations of polyphagia, polydipsia and behavioural changes may also be reported.
3. Concordance of the cat owner with the veterinary team will be enhanced if time is taken to explain all treatment options in detail, making use of the evidence-base available. It is reported that 95% of cat-owners 'google' consultations. Some information sources to support the practice team are listed in Box 1.
4. They can provide demonstrations to the cat owner on safe medication of hyperthyroid cats with potential teratogens, orally or transdermally.
5. They can contribute to pharmacovigilance on behalf of clinicians by reporting suspected adverse events when using medication.
6. They can ensure effective transitioning to an iodine-restricted diet to improve compliance.
7. As part of the surgical team involved in thyroidectomies, including monitoring for hypocalcaemia post-operatively.
8. They can advise on the behavioural enrichment helpful to cats during their specialist hospitalisation post RIT, both at the centre and if/when radiation care is required when the cat first returns home.
9. They can advise on dietary management of hyperthyroid cats to minimise the use of carbohydrates and maintain a high proportion of high-quality protein.
10. They can guide concerned cat-owners on current thinking of the causes of feline hyperthyroidism and suggestions to minimise risks, albeit with no evidence that this will impact on prevalence.

Box 1. Suggested information sources for cat owners interested in FH	
http://animalendocrine.blogspot.co.uk/search/label/Hyperthyroidism	
http://www.catinfo.org	
http://www.icatcare.org/advice/cat-health/hyperthyroidism-overactive-thyroid-gland	
http://www.hyperthyroidcatcentre.co.uk/#information	
http://www.vetprofessionals.com/catprofessional/hyperthyroidism.html	

Conclusion

The increasing prevalence of feline hyperthyroidism, still without an understanding of aetiology or effective prevention strategies, makes this a very frequent presentation in most companion animal practices. The veterinary nurse is ideally placed to facilitate early detection, enhance concordance between the practice team and the cat owner, and aid long-term management of feline hyperthyroidism patients.

Conflict of Interest Statement

The author is founder and clinical director of The Hyperthyroid Cat Centre, Wetherby, UK, providing radio-iodine treatment to hyperthyroid cats.

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