Feline Hyperthyroidism: the role of the VN/technician
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Nurses play a vital role!
- Diagnosis
  - eg ‘Wellcat’ clinics
  - Sample collection and processing
  - Owner communication
- Treatment
  - Owner education and support
    - Practical and emotional
  - Patient monitoring
  - Surgical care
  - etc

Lecture outline
- What is hyperthyroidism, how is it diagnosed?
  - What diagnostic challenges are most common?
- Following diagnosis, what other tests are important?
- What are the treatment options and how do we advise what is best for each cat?
  - What are the pros and cons of each treatment?
- Check-ups
  - How often are these needed and what should they include?
  - What important treatment complications should I know about?

Hyperthyroidism: Clinical Findings
- Middle aged and elderly cats (range 4-22 years, mean 10-13 y)
  - One case report in 8 mo kitten!
- No sex predilection??
- Signs vary from mild to severe depending on
  - Duration of hyperthyroidism
  - Other concurrent systemic disease
- Affects approx 10% of elderly cats

Major Clinical Findings

<table>
<thead>
<tr>
<th>Clinical sign</th>
<th>Approx freq</th>
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<tbody>
<tr>
<td>Weight loss</td>
<td>90%</td>
</tr>
<tr>
<td>Palpable thyroid nodule</td>
<td>85%</td>
</tr>
<tr>
<td>Heart murmur</td>
<td>55%</td>
</tr>
<tr>
<td>Polypagia - PP</td>
<td>50%</td>
</tr>
<tr>
<td>Vomiting</td>
<td>45%</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>40%</td>
</tr>
<tr>
<td>Hyperactivity/restlessness/aggression</td>
<td>40%</td>
</tr>
<tr>
<td>Polyuria / Polydipsia – PU/PD</td>
<td>35%</td>
</tr>
<tr>
<td>Skin/coat changes</td>
<td>20%</td>
</tr>
<tr>
<td>Diarrhoea</td>
<td>15%</td>
</tr>
</tbody>
</table>
I think this cat is hyperthyroid but I can’t palpate a goitre....

• Presence of a goitre increases the likelihood of the diagnosis of hyperthyroidism
  – Especially important in cases with equivocal T4 results
• If considering surgical thyroidectomy then localisation of the goitre is essential
• Potential reasons for not having a palpable goitre....
  – Tense and irritable cats can be difficult to palpate
  – Goitres can be very small
  – Ectopic hyperfunctional thyroid tissue may be responsible
  – Large goitres may descend with gravity into the thoracic cavity

I think this cat is hyperthyroid but I can’t palpate a goitre....

• Tips and tricks
  – Vary the cat’s neck position from straight ahead to turned to each side
  – Try tipping the cat up in case the thyroid has descended through the thoracic inlet
  – Clip the fur and wet down
  – Sedate or anaesthetise the cat
  – Consider scintigraphy

Diagnosis

• Rule out other causes of clinical signs
• Screening laboratory tests
• Resting T4
• Other thyroid tests
  – Free T4
  – Endogenous TSH
  – Scintigraphy
  – Thyroid function tests

Routine laboratory tests

• Which ones should I choose?
  – Aims of lab tests
  – Haematology, biochemistry, urinalysis
• What clues am I looking for?
  – Haematology:
    • Leucocytosis, eosinopenia
    • Erythrocytosis
  – Serum biochemistry
    • Mild to moderate ↑ in liver enzymes (ALT, ALP)

Confirming the diagnosis

• Total T4
  – High sensitivity and specificity
  – Uncommon to need complicated/repeat tests to diagnose hyperthyroidism
  – Be aware of methodology used and potential limitations
    • RIA generally preferred if in any doubt (eg Nationwide Specialist Labs, formerly The Hormone Lab/CSLS)

I’m sure this cat is hyperthyroid but the tT4 is normal.....

• Why is this?
  – Suppression of tT4 by concurrent illness
  – Early or mild disease – fluctuating levels of tT4
  – tT4 in lower half of reference range: hyperthyroidism is unlikely
Diagnosing difficult cases

- **Total T4**
  - Single test is usually diagnostic for hyperthyroidism
  - Repeat in a few weeks if a normal result is obtained
  - Consider test methodology used
- **Free T4 (ED)**
  - More sensitive than T4 but chance of false +ve result
  - If high in association with T4 > 30 nmol/l, very likely to be hyperthyroid
- **Endogenous TSH**
  - Canine assay
  - Hyperthyroid cats: low or undetectable levels

**Case study - Molly**

- 10 year FN DSH
- Farm cat (owner is a vet)
- Few months of clinical signs
  - Weight loss, polydipsia, loose F+
  - Tachycardia but no goitre
- In-house lab work
  - ALT 175
  - T4 48 nmol/l (high normal)
- External lab
  - T4 283 nmol/l (very high!!)

**How can we aid early diagnosis?**

- Owner education regarding clinical signs
- Follow iCatCare Wellcat guidelines for assessment of older cats

**Hyperthyroid cats: Further tests?**

- **BP assessment?? ✔**
  - Eye examination
  - BP Measurement
  - 10-30% patients hypertensive?
- **Cardiac assessment?? ✓**
  - Echo changes common (~40%)
  - Clinically significant in < 10%
- **Liver assessment?? ×**
  - Increased liver enzymes very common
  - Rarely significant
- **Urine culture ✔**
  - ~ 12% patients positive
  - Most ‘silent’ (clinically and from lab perspective)

**Diagnosis: summary**

- Some care now required with interpretation of thyroid test results
  - No test has 100% sensitivity and 100% specificity!
  - Possibility of false +ve and false –ve
    - Consider test methodology
  - Look at the cat AND the lab results – if something doesn’t fit
    - Look elsewhere (other DDx, other test methodology)
    - Watch and wait is a sensible plan

**Treatment Options**

- Anti-thyroid drugs
- Surgery
- Radioactive iodine
- Hill’s y/d
What is the best treatment?

<table>
<thead>
<tr>
<th>Factor</th>
<th>Medical</th>
<th>Nutritional</th>
<th>Surgical</th>
<th>Radioiodine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curative?</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Side-effects?</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>How common?</td>
<td>≤ 20%</td>
<td>N/A</td>
<td>≤ 10%</td>
<td>≤ 5%</td>
</tr>
<tr>
<td>How serious?</td>
<td>Can be very</td>
<td>N/A</td>
<td>Can be very</td>
<td>Not usually</td>
</tr>
<tr>
<td>Permanent hypo?</td>
<td>No</td>
<td>No</td>
<td>7 Rare</td>
<td>7 Rare</td>
</tr>
<tr>
<td>Risk of recurrence?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Rare</td>
</tr>
<tr>
<td>Hosp needed?</td>
<td>No</td>
<td>No</td>
<td>Yes: &lt; 3d</td>
<td>Yes: 1 week</td>
</tr>
<tr>
<td>Available?</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

Don’t forget....

- Complicating features
  - Hypertension
  - Urinary tract infections
  - Cardiac disease (rare to be clinically significant)

Free Downloads on urine collection from cats, BP measurement and ocular manifestations of systemic hypertension

Anti-thyroid Medications

- Carbimazole, methimazole (thiamazole)
  - Carbimazole is converted to methimazole
  - Block production of thyroid hormones – a symptomatic treatment
  - Patients are typically euthyroid in 10-21d

Carbimazole and Methimazole

- Advantages
  - Widely available
  - No hospitalisation needed
  - No risk of hypoparathyroidism
  - Easy to prescribe
  - Rapidly effective
  - Titratable
  - Reversible
  - Cheap – only in the short term
  - Tolerated and effective as a long-term option in most cats

Carbimazole and Methimazole

- Drawbacks
  - Lifelong therapy required (cat and owner compliance)
  - Hyperthyroid cats can be difficult to medicate
  - Monitoring costs
  - Long-term – may be expensive depending on how long the cat lives
  - Transient minor side effects common (10-20% cats)
  - Major side effects rare (up to 5% of cats)
  - Occasional resistance seen (less than 2%)
  - Long-term use increases the risk of carcinoma development

Carbimazole and Methimazole

- Side-effects
  - Minor side effects common
  - 10 – 20% cats
    - V+, anorexia, lethargy, haematological abnormalities (↑ eos, ↓ lymphos, +ve ANA
    - Major side effects rare
    - up to 5% of cats
    - Persistent GI signs, haematology abnormalities (↓ plates, ↓ leuco, ↓ granulocytes), hepatopathy, dermatitis, prolonged PIVKA, myasthenia gravis, IMHA
    - Occasional resistance seen (less than 2%)
Transdermal thioureylenes

• Available in a number of countries
  – NB Not licensed in the UK, follow CASCADE
• Variable and poor bioavailability in healthy cats
• But is successful in cats with hyperthyroidism
  – eg 2.5 mg BID starting dose
• Timing of T4 monitoring not affected by once v twice daily treatment
• Tend to take longer to achieve euthyroidism
• Transdermal methimazole available from Summit Pharmaceuticals

Owner advice: transdermal methimazole

• Wear gloves or finger ‘cot’
• Inner pinna most commonly used
• Wipe away residual medication, gently clean
• Apply gel using finger or directly from syringe
• Gently spread over the inner pinna
• Alternate which pinna is used
• Remove gloves and wash hands

Medical management: successful long term care

• Check-ups are vital
  – Owner compliance (and support)
  – History, physical exam, weight
    • Response to treatment, side effects
  – Blood pressure
  – Lab work
    • T4: aim for lower half of ref range
    • Assess for side effects
    • First 3 months most important: Side-effects are very treatable – as long as they are detected!

What factors are important to owners?

• Owners enjoy and want to be fully involved in discussions
• They highly value veterinary advice
• Their priorities are to provide the lowest, appropriate dose of oral antithyroid medication
  – 85%: accuracy of dose in meeting the cat’s requirements was most important
  – Lower dose of medication was ranked second most important
• Twice daily medication is not a problem for most owners: around 80% happy to administer twice daily medication if needed – only 12% disagreed
• Once daily medication is not a priority – none ranked this most important

Nutritional management of hyperthyroidism

• Hill’s y/d
  – Iodine restricted, phosphate restricted, moderate protein levels
  – Effective in reducing T4 levels within 3 weeks of eating the food
  • Most cats euthyroid after 8 weeks, remainder usually euthyroid by 12 weeks
  – Requires total compliance – no treats, check whether supplements are OK to use, clean food bowl

Pros and cons of y/d

• Pros
  – Readily available
  – Reversible
  – No need for additional antithyroid medication
  – Usually euthyroid within 4-8 weeks
  – Can be used short or long-term
  – No side-effects other than potential for renal complications
  – Iatrogenic hypothyroidism appears very rare

• Cons
  – Owner and cat compliance needs to be 100%
  – No other food, treats or prey
  – Not recommended as a food for healthy cats
  – Not accepted by all cats
  – T4 usually remains in upper reference range
  – Small proportion of cats may not respond fully
  – Long-term studies lacking
  – What if another therapeutic diet is indicated?
Case selection

- Good candidates
  - Indoor only or limited roaming
  - Single cat homes
  - Dedicated owner
  - No or only mild evidence of CKD (IRIS Stage 1 or 2)
  - Short-term stabilisation required

- Poor candidates
  - Free roaming cats especially those that hunt and eat prey or that have access to food outside the home
  - Cats in multicat homes
  - Less dedicated owner
  - IRIS Stage 3 or 4 CKD
  - Faddy or fussy cats?
  - Cats requiring ‘contraband’ supplements
  - Severe hyperthyroidism? (eg T4> 200??)
  - Long-term stabilisation required??

Case study: Lucy

- 14y FN DLH
- Indoor only, single cat household
- Hill’s y/d selected as her treatment
  - Lucy is a tricky cat to medicate
  - Owner suffers from mobility disorder
- Diet accepted within a few days
- Check-ups
  - 4 weeks: weight gain, improved coat condition, T4 reduced
  - 8 weeks: further improvements, euthyroid
  - Lucy was stable on y/d for 2 years
- Owner delighted with this option

Gold Standard long-term care of cats on reversible treatments

1. Check-up consultations
   - 2-3 weekly until stable
   - First 3 months: continue to reassess every 4-6 weeks
   - 3 monthly thereafter (routine cases)

2. Blood pressure assessment
   - At diagnosis of hyperthyroidism
   - If normotensive, check again within 2 months; thereafter every 6 months
   - Hypertensive cats: weekly until stable, reducing to every 3-4 months

3. Blood tests
   - 2-3 weeks after starting treatment/dose change:
     - T4 and renal parameters until stable
     - (4 weeks for y/d and transdermal methimazole)
     - First 3 months: continue to reassess patient every 4-6 weeks
     - (haematology and biochemistry) if possible
     - 3 month check – if stable reduce to 6 monthly checks

4. Urine tests
   - Patients with no complications: every 6 months unless there
     is an indication from history, physical etc
   - Patients with complications: according to need

What about those that cannot afford ‘gold standard’ care?

- Prioritise what’s needed
- For most cats:
  - History and clinical examination are most helpful
    - These help to increase trust between you and your clients
  - BUT, there is a real risk of missing the very rare cases of (treatable) severe side-effects
Surgical thyroidectomy

- Stabilise medically or nutritionally first
- Advantages
  - Availability, possibility of cure, short hospitalisation
- But
  - Must be surgically accessible, GA required, possibility of side-effects, initial expense...

Radioiodine

- Local irradiation of the thyroid tissue
- Advantages
  - No GA, curative, side-effects rare, thyroid carcinomas, best overall prognosis
- But
  - Limited availability, cost, occasional hypothyroidism

Gold Standard long-term care of cats following curative treatments

1. Check-up consultations
   - Suture removal, wound check
   - First 3 months: once a month
   - 3 - 6 monthly thereafter
2. Blood pressure assessment
   - At diagnosis of hyperthyroidism
   - If normotensive, check again within 2 months; thereafter every 6 months
   - Hypertensive cats: weekly until stable, reducing to every 3-4 months

Gold Standard long-term care of cats on reversible treatments

3. Blood tests
   - One month post treatment
     - tT4, +/- TSH, haematology, biochemistry
   - 3 months post treatment (tT4 +/- TSH)
   - 6 – 12 monthly thereafter (tT4, haematology, biochemistry)
4. Urine tests
   - Patients with no complications: every 6 months unless there is an indication from history, physical etc
   - Patients with complications: according to need

Why is understanding hypothyroidism important?

- Most common as an occurrence following treatment for hyperthyroidism
- History and clinical features
  - May not be dramatic!
  - Lethargy, weight gain
  - Hypothermia
  - Seborrhoea sicca, alopecia
  - Myxoedema
- Lab findings
  - Hypercholesterolaemia
  - Mild non-regenerative anaemia

Hypothyroidism

- Confirm the diagnosis
  - Persistently low tT4, elevated cTSH (usually > 1 ng/ml)
  - Fail to respond to TRH/TSH
Clinical significance of hypothyroidism

• Associated with a significantly worse prognosis
• Higher proportion suffer from azotaemia and shortened survival
• Likely to be much more common than currently appreciated

Williams et al. JVIM 2010

Avoiding hypothyroidism

• Medical treatment
  – Titrate the dose:
    aim for tT4 in bottom half of reference range
  – Not too much, not too little….
    …….just right!
• Iodine-restricted food
  – Withdrawal of the food necessary if hypothyroidism seen
• Post iodine or surgery
  – Measure tT4, if low check cTSH levels (especially if azotaemic)
  – If hypothyroid, supplement with L-thyroxine 10-20μg/kg SID starting dose (eg 50-100 μg/cat)

Post-treatment deterioration in renal function

• Hyperthyroidism increases renal blood flow and GFR
  – Post-treatment GFR may fall by up to 50%
  – Fall in GFR not necessarily associated with problems
    • May worsen pre-existing renal disease
    • May un-mask occult renal disease
• GFR usually stable by 1 month following euthyroidism with no further deterioration
• How common are problems?
  – A third of patients 50%?
  – More likely to occur in hypothyroid cats

What’s the answer?

• For most cats, optimal treatment of hyperthyroidism will be tolerated without problems
  – Some cats (IRIS Stage 4, creatinine > 440 umol/l) may experience a renal crisis when their thyroid disease is treated
  – Some cats may need dose adjustments to balance both conditions
• Careful pre-treatment assessment is important
  – Owner education vital
• Traditional recommendations
  – Treat all hyperthyroid cats with a reversible treatment in case of problems
  – Titrate the dose to clinical and biochemical effect
  – ?? Unnecessarily cautious ??

Hyperthyroidism: prognosis

• Depends on
  – Severity of hyperthyroidism and associated complications
  – Presence of other diseases

Anna before treatment………..and after radioiodine
Thank you for listening!

For your CPD certificate...