WHAT IS YOUR DIAGNOSIS?

A seven year old, male neutered diabetic domestic shorthaired cat was presented to the R(D)SVS Internal Medicine Service for investigation of ongoing polydipsia, polyuria, polyphagia despite insulin therapy. The cat weighed 4.7kg and was receiving 11 iu Caninsulin twice daily. On physical examination, the cat was bright, alert and responsive. The heart rate was 160 beats per minute with no arrhythmia or pulse deficits. There was no abnormal respiratory noises audible on thoracic auscultation but very mild stertor was intermittently audible. The oral mucous membranes were pink and moist, capillary refill time was 2 seconds and skin turgor was normal. Abdominal palpation was generally unremarkable except for a full bladder and all peripheral lymph nodes were within normal limits. The rectal temperature was 38.8°C.

Urinalysis analysis showed SG 1.033, glucose +++ on dipstick but negative for ketones.

A blood glucose curve, performed at home, is shown below. Feeding and insulin administration were at 7.45am and 7pm:

1) **What problem is indicated by the glucose curve?**
2) **What are your differential diagnoses for this abnormality?**

3) **How would you evaluate this case further?**

1. **Glucose curve interpretation**

   The glucose seems to show some response to insulin administration but the effect is only marginal and the glucose level is very high throughout. This minimal response in the face on an insulin dose of >1.5 iu/kg is consistent with **insulin resistance**. This response could also be seen if insufficient insulin given or the insulin was poorly absorbed or subnormally effective; therefore, it is important to question the owner about dosage administration, whether the cat received the full dose, age of insulin and storage conditions. This type of curve can also be seen with the Somogyi effect (rebound hyperglycaemia) if the drop occurred before the curve was started. In this case, administration and storage were exemplary and a repeat curve also demonstrated the same pattern, confirming the diagnosis.

2. **Differential diagnoses for insulin resistance**

   - Chronic inflammation (especially pancreatitis)
   - Infection (especially of oral cavity or urinary tract)
   - Neoplasia
   - Acromegaly
   - Hyperthyroidism
   - Liver disease
   - Kidney disease
   - Congestive heart failure
   - Severe obesity
   - Hyperadrenocorticism

3. **Further evaluation of case**

   To investigate this case further, TT4 and fPLI were performed and were within reference range, making hyperthyroidism or pancreatitis unlikely. No other disease inflammatory disease process was evident on repeated examination and routine serum biochemistry revealed no evidence of liver or kidney disease. Thoracic radiographs were unremarkable and abdominal ultrasonography did not reveal any evidence of neoplastic lesions, but there was mild renomegaly with normal architecture.
He did not have overt facial thickening, mandibular brachygnathism or separation of the space between the upper and lower canine teeth (unlike dogs, the interdental spaces between the incisor teeth do not become obviously increased) typical of acromegaly. However, when comparing photographs taken two years previously to current images, it could be appreciated that there was some increase in the size of the muzzle (Figure 1).

![Figure 1: Note the widening of the muzzle seen in the lower image taken when diabetic compared to the image taken previously when well (upper image). This change was only noticeable when the two images were compared and less clear on clinical examination.](image)

To evaluate for acromegaly further, a serum insulin-like growth factor (IGF-1) assay was performed.

**IGF-1 >2000 NG/ML**  **ref >1000 supportive of acromegaly**

The diagnoses was further supported by a CT head study which demonstrated the presence of a pituitary mass (Figure 2).
Outcome

The pituitary mass was treated with a three week course of daily radiotherapy. The diabetes did not resolve but insulin requirement dropped to half of the previous dose. Three years later the mass was still present on repeat CT imaging but still smaller than the original measurements.

Discussion

Acromegaly in cats is caused by a pituitary mass that secretes excess growth hormone which causes insulin resistance. Growth hormone also causes an increase in IGF-1 to be produced from the liver, which is used for diagnosis being more stable and easier to transport and assay. Acromegaly is thought to be more common underlying disease in diabetic cats than previously thought, with some studies suggesting that up to 26% of diabetic cats meet the diagnostic criteria for acromegaly. Apart from insulin-resistant diabetes mellitus, acromegaly causes increased soft tissue growth and skeletal changes leading to cardiomegaly, renomegaly, degenerative joint disease, and stertor. Treatment options include radiotherapy, hypophysectomy or medical therapy with longer acting somatostatin analogues (although medical therapy has yet to be shown to be truly effective). Another option is conservative management aimed at managing the diabetes without directly addressing the acromegaly. This case received radiotherapy and showed a good improvement in glycaemic control. In one case series of diabetic cats, 13/14 had improved glycaemic control after radiation therapy, of which six no longer required insulin therapy.

The majority of cats (60%) with acromegaly do not show the typical phenotypic changes associated with the disease and with a higher incidence than previously recognized, it is important to consider this disease in any difficult-to-control diabetic cat.
References


