WHAT IS YOUR DIAGNOSIS?

An 11 year old male neuter miniature schnauzer presented with a history of several months of lethargy and mild increase in thirst, with periods of panting and restlessness. Intermittent diarrhoea and abdominal discomfort had also been noted. Clinical examination was largely unremarkable except for senile nuclear sclerosis in both eyes, tartar and some tortuosity of the retinal vessels. Systolic blood pressure was elevated at 180 mmHg. Routine haematology and serum biochemistry were mostly unremarkable except for mild elevations in liver enzymes (AP 269 U/L, reference range 20-60; ALT: 258 U/L, reference range: 21-102).

An abdominal ultrasound revealed a 1.6cm mass in the left adrenal gland (figure 1). The right adrenal mass was normal in size (4.3mm width). Urinalysis showed a concentration of 1.032 and protein ++ on dipstick analysis. Urine protein:creatinine ratio (UPC) was elevated at 4.2.

1) What are your differential diagnoses for an adrenal mass?

2) How would you investigate this dog further?

3) What are the treatment options for dog?
1. **Differential diagnosis for adrenal mass:**
   - Functional cortical adenoma/adenocarcinoma causing hyperadrenocorticism (Cushing’s syndrome)
   - Functional cortical adenoma/adenocarcinoma causing hyperaldosteronism (Conn’s syndrome)
   - Phaeochromocytoma
   - Sex-hormone producing adenoma/adenocarcinoma
   - Non-functional cortical adenoma/adenocarcinoma (‘Incidentaloma)
   - Metastatic tumour
   - Granuloma
   - Abscess

2. **Further investigation**

   Investigation focussed on trying to ascertain if the adrenal mass was functional or not to determine if this was the cause of the clinical signs and to determine the optimal treatment strategy. Hypertension can be seen with phaeochromocytoma, hyperadrenocorticism or hyperaldosteronism. Hypokalaemia is often seen in hyperaldosteronism, which was not present in this case, making Conn’s syndrome less likely. Elevated liver enzymes can be seen with hyperadrenocorticism and with phaeochromocytoma, although the alkaline phosphatase is often proportionally more elevated in Cushing’s disease. In adrenal-dependant hyperadrenocorticism, we would typically expect atrophy of the contralateral gland, which was not present in this case, making it overall more likely that the mass was a phaeochromocytoma.

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Figure 1: Enlarged left adrenal gland
Testing was performed to further rule out hyperadrenocorticism and to get a more definitive diagnosis of phaeochromocytoma.

A home-collected urine sample was submitted for a urine cortisol:creatinine ratio. The result (5 x 10^6 reference range <30 x 10^6) made hyperadrenocorticism very unlikely. If the result had been above the reference range, it can be due to Cushing’s disease but also can be seen with many other illnesses so further testing would have been necessary (low dose dexamethasone suppression test, ACTH stimulation test).

The home-collected urine sample was also submitted for a normetanephrine:creatinine ratio (result was 600 ref <100) which was consistent with a diagnosis of phaeochromocytoma.

A CT scan was also performed to determine local extent/invasion for surgical planning and to look for the presence of metastases. No metastases or vascular invasion were identified.

![CT scan showing adrenal mass](image)

3. Treatment

The hypertension was controlled with a combination of enalapril and amlodipine. This resulted in an improvement in clinical signs and urine protein:creatinine ratio reduced to 1.7. Three weeks prior to surgery, amlodipine was discontinued and replaced with phenoxybenzamine 0.25 mg/kg PO q 12hrs and titrated up to 1 mg/kg PO q 12hrs with frequent blood pressure monitoring to ensure both control of hypertension and make
up the patient did not become hypotensive. Left adrenalectomy was performed successfully and histopathology confirmed the diagnosis of phaeochromocytoma. The blood pressure has remained controlled on enalapril only post-surgery and is continuing to be weaned down. The UPC has also continued to improve with the latest value further reduced to 0.9

Discussion

Phaeochromocytoma is a catecholamine-producing tumour that arises from the adrenal medulla. It is most frequently diagnosed in older dogs (average 11 years) and has no known gender or breed predilection. Clinical signs are variable and are related to catecholamine release predominantly but can also present due to space-occupying effects (hindlimb weakness or swelling or reduced pulses) or due to haemorrhage.

When adrenal masses are identified, it is important to identify if they are functional or non-functional. Non-functional ‘incidentalomas’ are often slow growing and not associated with clinical signs so only need to be monitored. The treatment of choice for functional adrenal masses is adrenalectomy. However, it is important to try and ascertain the tumour type prior to surgery to allow for pre-, peri- and post-operative management. For example, phenoxybenzamine is used to prevent catecholamine-induced complications such as hypertensive crises, arrhythmias and pulmonary oedema: phenoxybenzamine treated dogs have a significantly lower mortality after adrenalectomy than untreated dogs. Equally, if the mass was cortisol-producing, we would expect a need for corticosteroids immediately post-surgery due to atrophy of the contralateral gland. Hence, the management will change depending on the nature of the tumour.

If adrenalectomy is not possible, longer term medical therapy with phenoxybenzamine, and potentially toceranib, can be used.

References

