Endocrine & Anesthesia Protocols: An Exclusive Series
This series focuses on anesthesia considerations for dogs and cats with conditions of the pancreas, thyroid, parathyroid, and adrenal glands.

Anesthesia for Adrenal Gland Disease

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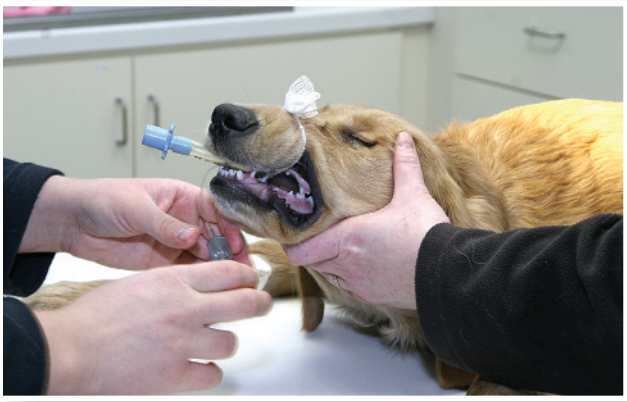

You have asked…

What is the best approach for anesthetizing patients with adrenal gland disease?

The expert says…

The adrenal gland has far-reaching systemic influence, and diseases that might influence anesthesia management are likewise wide ranging.[1-3]

Q&A What is the suggested protocol for patients with hypoadrenocorticism?

Hypoadrenocorticism (Addison's disease), observed in both dogs and cats, may refer to deficiency of glucocorticoids, mineralocorticoids, or both. Many causes exist, including immune-mediated, idiopathic, and iatrogenic. Mineralocorticoids (eg, aldosterone) promote sodium and water reabsorption and potassium excretion at the renal tubules, whereas glucocorticoids are responsible for significant physiologic actions, such as counteracting stress, maintaining cardiovascular function, exerting antiinflammatory effects, and metabolizing fat, protein, and carbohydrates. Clinical manifestations (eg, vomiting, diarrhea, diminished appetite, lethargy) can be vague and broad ranging.

In crisis presentations, many patients are hyperkalemic and hyponatremic. Patients may also be dehydrated and volume contracted and have laboratory findings consistent with prerenal azotemia. Hyperkalemia may result in bradycardia and, if unmanaged, could lead to cardiac arrest. Hypoglycemia may also be observed.

Definitive diagnosis is made with the adrenocorticotropic hormone (ACTH) stimulation test; endogenous ACTH assays also differentiate primary and secondary forms of disease.

MORE ▶

ACTH = adrenocorticotropic hormone

Fast Fact

Hyperadrenocorticism is usually recognized in middle-aged and older dogs but is uncommon in cats.

Considerations & Management

While atypical in a patient presenting in crisis, anesthesia may be required for an emergency procedure. Considerations for anesthetic management include dehydration and hypovolemia, resulting in hypotension, poor tissue perfusion, metabolic acidemia, and electrolyte changes. If glucocorticoid deficiency is also present, the animal is unlikely to mount a stress response and may not respond to supportive cardiovascular interventions (eg, inotropes). Following diagnosis, treatment may be directed to the primary cause. If supplementation is necessary, hydrocortisone best mimics mineralocorticoid and glucocorticoid actions and may be administered IV by CRI or intermittent bolus. Dexamethasone does not interfere with the ACTH stimulation test and may be provided as an alternative for patients that require support for stress during hospitalization.

A balanced electrolyte solution should be used to correct volume contraction, dehydration, and azotemia. If hyperkalemia and resultant bradycardia are life-threatening, calcium chloride, sodium bicarbonate, or insulin and glucose therapy may be instituted following rehydration and IV volume expansion.

An anesthetic plan for a dog in crisis follows.

Premedication

Opioids (eg, hydromorphone, 0.1 mg/kg SC) and anticholinergics (eg, atropine, 0.03 mg/kg SC) should be administered to offset opioid-induced bradycardia.

Induction (Canine Patients)

Opioids (eg, fentanyl, 10 µg/kg IV) and benzodiazepines (eg, midazolam, 0.25 mg/kg IV) are recommended for their low impact on cardiovascular function, as long as bradycardia is treated and hypoventilation managed. This approach is reversible. In the volume-contracted patient without cardiovascular reserve and normal responsiveness, drugs with minimal impact on cardiovascular function are ideal.

Use of etomidate is controversial, as it interferes with glucocorticoid secretion; however, because it does not interfere with glucocorticoid function, etomidate may be used as an alternative to an opioid in a patient receiving glucocorticoid supplementation.

Anesthesia Maintenance

An inhaled agent with infusion of a short-acting opioid (eg, fentanyl, remifentanil) is recommended to facilitate reduction of the inhaled anesthetic dose. Alternatively, the opioid used for premedication may be redosed.

Periprocedural Analgesics

Use of an analgesic depends on the procedure, but most typically a mu-opioid agonist is administered.

Support & Monitoring

Before anesthesia, monitoring equipment should be placed and hydration, acid–base balance, electrolytes, blood glucose, PCV, and total protein values checked and abnormalities corrected. The ECG is critical for diagnosing arrhythmias, and blood pressure should be directly monitored. Placement of an arterial catheter also provides easy access for repeated sampling of blood to check aforementioned values as well as blood gases. If oxygenation and ventilation are monitored noninvasively, a venous blood gas provides a good alternative method for rechecking electrolytes, glucose, PCV, and total protein. Ventilatory support is recommended with high-dose opioid administration. Hydrocortisone or dexamethasone administration should be considered during the perioperative period.

Recovery

Monitoring and support should be continued transiently through the postoperative period. Opioid infusion can be discontinued or the dose decreased (20–30 minutes) before recovery to facilitate return to spontaneous ventilation. They should then either be continued or reinstated at lower doses until the patient can be transitioned to oral analgesic medications and those needed to treat glucocorticoid and mineralocorticoid deficiencies.

Q&A What is the suggested protocol for patients with hyperadrenocorticism?

In hyperadrenocorticism (Cushing's disease), glucocorticoid excess may be iatrogenic or as a result of adrenal masses or pituitary disease. This syndrome is usually recognized in middle-aged and older dogs but is uncommon in cats, in which the syndrome is associated with diabetes mellitus. These patients tend to be hypercoagulable and hypertensive. Clinical signs include polyphagia, alopecia, thin skin, hyperpigmentation, polyuria, polydipsia, pendulous abdomen, muscle weakness, lethargy, and hepatomegaly. Elevations in liver enzymes, cholesterol, and blood glucose are also reported, along with leukocytosis.

Many tests can confirm disease origin (pituitary or adrenal)—ACTH assays, high-dose dexamethasone suppression, and CRH stimulation. Ultrasonography, CT scans, and MRI imaging may also confirm disease origin.

Considerations & Management

While there are no specific drug protocols for hyperadrenocorticism, the clinical picture must be considered. For example, when clipping for a catheter, consider that the patient may be more susceptible to bruising and hair regrowth may be slow. Veins may also be more fragile.

Aseptic technique is essential, as these patients are more susceptible to infection. Patients exhibiting muscle weakness, enlarged liver, and pendulous abdomen will benefit from preoxygenation and ventilation support. Thromboembolism is a recognized complication with occasionally fatal outcomes. In patients with pituitary disease, CNS signs must be evaluated and addressed. In these patients, concurrent and previously undiagnosed pheochromocytomas have been identified during histopathologic evaluation of the adrenal gland; cardiac arrhythmias and broad blood pressure fluctuation are likely to be seen.[4]

Premedication

Opioids and anticholinergics can be used as warranted. Tranquilizers are not usually necessary in older patients, but low-dose acepromazine may be administered in anxious patients with nonpituitary-dependent disease.

Anesthesia Induction

There is no specific agent requirement. While etomidate may best be avoided as it causes temporary suppression of adrenocortical function, it does not interfere with glucocorticoid action.

Anesthesia Maintenance

Inhaled agent is recommended.

Periprocedural Analgesics

Selection depends on the procedure.

Support & Monitoring

Heart rate and rhythm, blood pressure (patients may be hypertensive), oxygen saturation, ventilation, and body temperature should be monitored. IV fluid administration is necessary, as many patients are polyuric. Patients with pituitary tumors should have arterial carbon dioxide tensions maintained in the low normal range. When hypercoagulability is suspected, interventions such as heparin with fresh-frozen plasma, colloids (eg, hetastarch), and early return to ambulation have been suggested.

Recovery

Patients are monitored for return of mentation, normal oxygenation, and ventilation.

Additional Considerations

For patients undergoing radiation therapy for pituitary-based tumors or for which adrenalectomy is planned, additional considerations are warranted.[1-3,5] ■ cb

See **Aids & Resources**, back page, for references & suggested reading.

Fast Fact

In patients with pituitary disease, CNS signs must be evaluated and addressed.

For More

Look for the next and final installment of this series in a future issue!

ACTH = adrenocorticotropic hormone, CRH = corticotropin-releasing hormone