

Toby: A hypoadrenocorticism (Addison's disease) case study



Patient:

Toby, 9-year-old, neutered male Labrador retriever

Presenting reason:

Swelling on the side of the face

History:

The owners obtained Toby as a puppy. He was current on all vaccines and flea, tick, and heartworm preventives, and had received annual preventive care lab work for the past three years. He has no history of major health concerns other

than arthritis, which is managed with daily oral carprofen. The owners expressed concern that Toby recently developed a swelling on his face. He was otherwise doing well at home, eating and drinking normally.

Physical examination:

Toby was bright, alert, and responsive. His temperature, pulse, and respiration were normal. He had a good body condition score (6/9). There was swelling over the upper 4th premolar, which was suspicious for a tooth root abscess. The rest of his physical examination was unremarkable.

Diagnostic plan

Toby was started on an antibiotic and scheduled for a dental procedure. A preanesthetic workup was recommended including a complete blood count (CBC), comprehensive chemistry panel with electrolytes and IDEXX SDMA® Test, total T₄, complete urinalysis, and an IDEXX 4Dx® Plus Test.

Diagnostic review

Toby's CBC revealed a significantly decreased reticulocyte hemoglobin (RETIC-HGB) without anemia. Decreased RETIC-HGB reflects decreased iron availability for recent red blood cell production. The most common causes are blood loss or inflammatory conditions. In Toby's case, this could be due to the dental abscess, although concurrent blood loss (possibly gastrointestinal given the history of carprofen) could not be ruled out. His leukogram was normal with no evidence of inflammation or stress.

Minor changes were noted in Toby's chemistry panel including mild hypoglycemia and hypoalbuminemia. A mild increase in AST was also present. A low specific gravity was noted on Toby's urinalysis with quiet sediment. His Lab 4Dx® Plus Test was negative, and total T₄ was within the normal reference interval.

Toby did not have evidence of protein loss in his urine or GI signs that would suggest loss of protein through the intestinal tract. Mildly decreased albumin and glucose had been noted in prior preventive care bloodwork for several years with some normal results intermixed. Given the absence of clinical signs, these changes had previously been considered clinically insignificant and likely representative of normal variation.

Chemistry

Chemistry	2/8/23 3:50 PM		
Glucose	61	63 - 114 mg/dL	
IDEXX SDMA	d. 12	0 - 14 µg/dL	
Creatinine	1.0	0.5 - 1.5 mg/dL	
BUN	15	9 - 31 mg/dL	
BUN: Creatinine Ratio	15.0		
Phosphorus	2.6	2.5 - 6.1 mg/dL	
Calcium	9.7	8.4 - 11.8 mg/dL	
Sodium	145	142 - 152 mmol/L	
Potassium	4.4	4.0 - 5.4 mmol/L	
Na: K Ratio	33	28 - 37	
Chloride	116	108 - 119 mmol/L	
TCO2 (Bicarbonate)	22	13 - 27 mmol/L	
Anion Gap	11	11 - 26 mmol/L	
Total Protein	6.5	5.5 - 7.5 g/dL	
Albumin	2.6	2.7 - 3.9 g/dL	
Globulin	3.9	2.4 - 4.0 g/dL	
Albumin: Globulin Ratio	0.7	0.7 - 1.5	
ALT	75	18 - 121 U/L	
AST	63	16 - 55 U/L	
ALP	118	5 - 160 U/L	
GGT	3	0 - 13 U/L	
Bilirubin - Total	0.2	0.0 - 0.3 mg/dL	
Bilirubin - Unconjugated	0.1	0.0 - 0.2 mg/dL	
Bilirubin - Conjugated	0.1	0.0 - 0.1 mg/dL	
Cholesterol	176	131 - 345 mg/dL	
Creatine Kinase	174	10 - 200 U/L	
Hemolysis Index	e. N		
Lipemia Index	f. N		

Hematology

Hematology		2/8/23	3:50 PM
RBC	6.68	5.39 - 8.70 M/ μ L	
Hematocrit	38.7	38.3 - 56.5 %	
Hemoglobin	13.5	13.4 - 20.7 g/dL	
MCV	58	59 - 76 fL	
MCH	20.2	21.9 - 26.1 pg	
MCHC	34.9	32.6 - 39.2 g/dL	
% Reticulocyte	0.7	%	
Reticulocytes	47	10 - 110 K/ μ L	
Reticulocyte Hemoglobin	18.6	24.5 - 31.8 pg	
WBC	11.9	4.9 - 17.6 K/ μ L	
% Neutrophils	76.8	%	
% Lymphocytes	17.0	%	
% Monocytes	2.1	%	
% Eosinophils	4.1	%	
% Basophils	0.0	%	
Neutrophils	9.139	2.94 - 12.67 K/ μ L	
Lymphocytes	2.023	1.06 - 4.95 K/ μ L	
Monocytes	0.25	0.13 - 1.15 K/ μ L	
Eosinophils	0.488	0.07 - 1.49 K/ μ L	

IDEXX DecisionIQ™ Addison's disease risk

Patterns present in Toby's bloodwork results triggered an IDEXX DecisionIQ™ Addison's disease risk indicator.

The IDEXX DecisionIQ™ Addison's disease risk indicator is a machine-learning artificial intelligence model developed to support clinicians by identifying dogs who are at an increased likelihood of Addison's disease and who would benefit from targeted screening. Based on the normal electrolytes and reported lack of clinical signs, IDEXX DecisionIQ™ recommended screening with a resting cortisol to be followed by an ACTH stimulation test if indicated based on the results.

IDEXX DecisionIQ™

⚡ Addison's Disease Risk

Has this dog been on any recent systemic or topical medications in the last 1-3 months which might affect cortisol production? ^

No, no recent medications that impact cortisol production

Yes, treatment for Cushing's disease

Yes, recent glucocorticoid medications

Does this dog have one or more clinical signs consistent with hypoadrenocorticism (Addison's Disease)? ^

Yes, Addison's clinical signs present

No, Addison's clinical signs not present

There are patterns present in this patient's recent bloodwork that are suggestive of possible Addison's disease.

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NEXT STEP CONSIDERATIONS

Evaluate findings in light of patient history and recent medications. In a dog without clinical signs, consider screening for Addison's disease:

- Resting cortisol
- ACTH stimulation test if indicated

Next steps and results

Because of the risk of anesthetizing an uncontrolled Addisonian dog, the veterinarian recommended that Toby be tested for Addison's disease prior to the dentistry. A baseline cortisol was added to the bloodwork already at the laboratory. The results showed that Toby had very low levels of circulating cortisol. A follow-up ACTH stimulation test was performed next. Toby's adrenals showed no response to the ACTH with both the pre-ACTH and post-ACTH results below the level of detection.

Resting cortisol

Endocrinology		2/8/23	3:50 PM
Total T4	a. 1.4	1.0 - 4.0 μ g/dL	
Cortisol	<0.2	2.0 - 6.0 μ g/dL	

ACTH stimulation test

Endocrinology		2/13/23	3:40 PM
Cortisol - Pre-ACTH	<0.2	μ g/dL	
Cortisol - Post-ACTH	a. <0.2	μ g/dL	
a. ACTH Reference Range:			
Canine:	Feline:		
2-6	0.5-5	Pre-ACTH (resting) cortisol	
6-18	5-15	Post-ACTH cortisol	
18-22	15-19	Equivocal post-ACTH cortisol	
>22	>19	Post-ACTH cortisol consistent with hyperadrenocorticism	
<2	<0.5	Post-ACTH cortisol consistent with hypoadrenocorticism	
1-5	n/a	Desired pre- and post-ACTH cortisol on lysodren® therapy	
1.5-6	1.5-6	Desired pre-and post-ACTH cortisol on trilostane® therapy	

Diagnosis

Toby was diagnosed with Addison's disease based on the results of the ACTH stimulation test.

Follow-up

Toby's dental procedure was postponed while his condition was stabilized. The carprofen was discontinued and, after three days, prednisone was initiated. Antibiotics were continued for the dental abscess.

Two weeks later, a recheck chemistry panel was performed to monitor for electrolyte changes which might indicate the need to start mineralocorticoid treatment. Toby's chloride was below the reference interval, but his sodium, potassium, and sodium:potassium ratio were within normal limits. His albumin and glucose were also now within normal limits.

Recheck chemistry

Chemistry		2/27/23	3:24 PM
Glucose	69	63 - 114 mg/dL	
IDEXX SDMA	a. 10	0 - 14 μ g/dL	
Creatinine	0.7	0.5 - 1.5 mg/dL	
BUN	30	9 - 31 mg/dL	
BUN: Creatinine Ratio	42.9		
Sodium	146	142 - 152 mmol/L	
Potassium	4.7	4.0 - 5.4 mmol/L	
Na: K Ratio	31	28 - 37	
Chloride	103	108 - 119 mmol/L	
Total Protein	7.2	5.5 - 7.5 g/dL	
Albumin	3.1	2.7 - 3.9 g/dL	
Globulin	4.1	2.4 - 4.0 g/dL	
Albumin: Globulin Ratio	0.8	0.7 - 1.5	
ALT	122	18 - 121 U/L	
ALP	117	5 - 160 U/L	

A plan was made to pursue the dental treatment following an additional check of his electrolytes. After his dentistry, Toby will be monitored routinely with a CBC, chemistry panel, and electrolytes to assess the need for mineralocorticoid treatment and ensure his condition remains stable.

Toby's owners are grateful that his veterinarian, in partnership with IDEXX DecisionIQ™, was able to diagnose this serious condition that could have been life-threatening had he been anesthetized without treatment.

Discussion

Hypoadrenocorticism, also known as adrenal insufficiency or Addison's disease, is a condition that results from a bilateral dysfunction of the adrenal cortex, or outer layer of the adrenal glands. The adrenal cortex produces important hormones including aldosterone (mineralocorticoid), cortisol (glucocorticoid), and other adrenal androgens. The typical representation of Addison's disease is a deficiency of both glucocorticoids and mineralocorticoids. These hormones are crucial for the regulation of heart rate, blood glucose, blood pressure, electrolyte balance, digestion, and maintaining homeostasis in response to physical and mental stress.

CBC abnormalities in patients with Addison's disease can show mild non-regenerative anemia, eosinophilia, and an absence of a stress leukogram. Chemistry panel abnormalities can include azotemia, hypocholesterolemia, hypoglycemia, hypoalbuminemia, hypercalcemia, hyperkalemia, hypochloremia, hyponatremia, low Na:K ratio, and elevated liver enzymes. Abnormal electrolytes due to mineralocorticoid deficiency are among the more recognizable signs of Addison's disease. However, they are seen inconsistently in Addison's and may only be present with more advanced disease or when a dog is in crisis.

Atypical primary Addison's disease cases with isolated glucocorticoid deficiency are rare. Most cases initially presenting as glucocorticoid-deficient only will go on to develop electrolyte abnormalities requiring mineralocorticoid supplementation within three months of initial diagnosis.

Most cases have a history of vague, intermittent clinical signs that can include ADR, recurrent digestive upset, lethargy, weight loss, increased urination, and decreased appetite. These signs may worsen in association with stressful events. Some may present in crisis with collapse, hypovolemia, and bradycardia. Both the nonspecific or intermittent GI signs and more subtle patterns seen within a CBC and biochemistry in earlier Addison's disease can be mistaken for more common diseases. About 30% of the time, Addison's disease is diagnosed after the dog has experienced an Addisonian crisis. These crises can be severe, requiring hospitalization. Left untreated or without rapid intervention, Addison's disease can be fatal.

Toby was considered a healthy dog at the time he presented for facial swelling. He did not have a history of intermittent GI signs or other concerning clinical signs. His preanesthetic bloodwork did have subtle abnormalities that could be consistent with Addison's disease, which were detected by the IDEXX DecisionIQ™ Addison's disease risk indicator. In retrospect, his owner recalled him being very tired after one prior visit to the veterinary hospital. Subtle signs after periods of stress often go unrecognized when they resolve after a short amount of time.

Toby's case highlights the importance of annual preventive care and preanesthetic diagnostics along with viewing and trending patient results in VetConnect® PLUS with IDEXX DecisionIQ™. Technology and medical expert-based systems in IDEXX DecisionIQ™ brought attention to these subtle diagnostic patterns in lieu of obvious clinical signs.

