



PATIENT

Buddy Hayes

SPECIES

Canine

BREED

Dachshund

SEX

M/N

AGE

10 years 7 months

WEIGHT

29.6 lbs.

INTERPRETED BY

R. McKenzie Daniel,
DVM, DABVP
(Canine and Feline)

IMAGING PERFORMED BY

Dr. Mack-E

HOSPITAL NAME

Northside VC

REFERRING VET

Dr. Mack-E

INVOICE

15849

DATE

1/17/23

PRESENTING CLINICAL SIGNS

Patient presented for a mass removal and dental consultation. At visit, owner had mentioned patient drinks a lot of water, but is doing well otherwise.

Abnormal PE/Chem/CBC/UA Results: - PE: Bilateral submandibular lymph node or salivary enlargement. - CBC: - RBC 9.07, MCH 20.9, RETIC-HGB 20.0 - Chem: - ALT 259, ALKP 838, GGT 23, AMYL 397 - Xray: - Severely enlarged liver with rounded margins - Copious stool throughout colon - Generalized gastric intestinal wall thickening - VHS 10.5

ULTRASONOGRAPHIC EXAMINATION OF THE ABDOMEN

Urinary System

The urinary bladder, trigone, cystourethral junction, and visible pelvic urethra to a depth of 3.0 cm exhibited normal thickness and tone. Anechoic urine was present in the lumen with no uroliths or sediment. The ureteral papillae were normal. The ureters were not visible which is normal. No evidence of inflammatory or neoplastic changes was noted.

No overt pathology associated with the residual prostate was noted.

The area of the aortic trifurcation was free of pathology.

Normal size and margination were present in the kidneys. A normal 1:3 cortex / medulla ratio was maintained. The medulla and cortices were uniform in texture with some increased echogenicity and mild loss of corticomedullary symmetry and definition expected for the age of the patient. No evidence of pelvic dilation or pyelectasia was present. The left kidney measured 5.4 cm in length. The right kidney measured 6.0 cm in length.

Adrenal Glands

Both adrenal glands were enlarged exhibiting mild asymmetrical yet intact capsule contour with nonhomogeneous nodular parenchyma. An example of a left adrenal nodule measured 2.0 cm x 0.9 cm. An example of a right adrenal nodule measured 1.9 cm x 0.9 cm. The overall left adrenal gland measured 1.2 cm width at the caudal pole and 1.2 cm width at the cranial pole. The overall right gland measured 1.0 cm width at the caudal pole and 1.0 cm width at the cranial pole.

Spleen

The spleen exhibited primarily finely textured parenchyma which was hyperechoic to the liver and renal cortical parenchyma. Mild generalized parenchyma heterogeneity was present without evidence of nodular changes. The capsule was smooth and regular without apparent expansion. The splenic vasculature at the hilus was normal in volume with no evidence of congestion or thrombosis. The parenchymal heterogeneity is likely consistent with benign changes such as extramedullary hematopoiesis or age-related remodeling with minor potential for inflammatory or neoplastic disease.

Liver/ Gallbladder

The liver presented enlarged in size. The parenchyma of the liver was subjectively normal in echogenicity compared to the spleen and renal cortices. The liver parenchyma was uniform with a mildly coarse echotexture. The capsule of the liver was symmetrically rounded to mildly swollen in margination. The



PATIENT	hepatic and portal vasculature were normal in appearance without signs of congestion. The gallbladder was non-distended in size containing primarily anechoic luminal content with mild congealed yet organized echogenic luminal debris. The cystic and common bile ducts were normal.
Buddy Hayes	
SPECIES	<i>Gastrointestinal</i>
Canine	The stomach presented intact wall layering with a normal wall layer ratio. The lumen of the stomach was empty with no signs of ileus, obstruction, or foreign material.
BREED	
Dachshund	The small intestine presented intact wall layering with 1:3 muscularis/mucosa ratio. The lumen of the small intestine was empty with no signs of ileus, obstruction, or foreign material.
SEX	Normal visible colon wall layers were present with apparent formed feces in lumen.
M/N	<i>Pancreas</i>
AGE	The parenchyma of the left limb, body, and right limb of the pancreas presented isoechoic to the adjacent omental fat. A normal curvilinear capsule contour of the pancreas was present. The visible pancreatic duct was normal. No signs of active inflammation or neoplastic disease were evident.
10 years 7 months	
WEIGHT	<i>Free Abdomen</i>
29.6 lbs.	No overt lymphadenopathy or peritoneal effusion was present.
INTERPRETED BY	ULTRASONOGRAPHIC FINDINGS
R. McKenzie Daniel, DVM, DABVP (Canine and Feline)	<ul style="list-style-type: none"> • Bilateral nodular adrenomegaly • Hepatomegaly - subjectively benign, suggestive of vacuolar hepatopathy, potential for nonobstructive cholestasis, inflammatory hepatopathy with infiltrative neoplasia considered unlikely • Mild gallbladder debris (non-mucocele) • Mild chronic renal changes • Overtly normal gastrointestinal tract
IMAGING PERFORMED BY	INTERPRETATION OF THE FINDINGS & FURTHER RECOMMENDATIONS
Dr. Mack-E	The bilateral nodular adrenomegaly may indicate functional vs. nonfunctional adenomas. Benign hyperplasia, potential for emerging neoplasia i.e., pheochromocytoma cannot be definitively excluded. A full adrenal workup with LDDST is recommended. Screening and monitoring for evidence of hypertension is suggested.
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15849	Further renal staging to include urine C/S and protein: creatinine ratio on sterile urine sample may be considered.
DATE	Pending adrenal testing or if clinically indicated, screening FNA cytology could be considered. Hepatosupportive medications may prove beneficial. Sonographic monitoring of the nodular changes in both adrenals for evidence of progression is recommended.
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Efficient & Accurate Cushing's Work up

Notes regarding Cushing's Clinical Presentations:

Nearly all Cushing's dogs have SAP elevations and true PU/PD (USG < 1.025) and most are polyphagic. Cushing's dogs are > 6 years and usually > 9 years old, usually have poor skin coats, body scores > 3/5, and are usually sedentary animals.

Its important to remember that Cushing's dogs usually look and play the part and other diseases cause false + stress related cortisol spikes. On rare occasion a Cushing's dog will not follow the rules but this is truly an exception.

Potential Cushing's patient workups can be costly and frustrating if not definitive and, in my experience, the non-definitive patient usually has something else going on that may be contributing to some of the clinical signs a Cushing's dog will have, especially SAP elevations or PU/PD. Based on this prelude of information I came up with the following algorithm in the spirit of diagnostic efficiency.

The following suggested protocol is based on current available literature on Cushing's disease and extensive clinical-sonographic experience evaluation + Cushing's and False + LDDST & ACTH stim. cases in order to maximize the efficiency of a Cushing's workup in practice.

Screen first, workup second

1) **UA:** Repeatable (2-3 urine samples) Urine specific gravity & urine cortisol/creatinine ratio (UCCR): If **repeatable USG < 10.20 and + UCCR** move to next step 2.

Note: UA is inexpensive and easy to obtain and if UA criteria is not met for Cushing's then resources can be spent into other more pertinent diagnostics or left on hold until the UA criteria is met in emerging Cushing's cases.

2) **Sonogram:** Does the patient **have concurrent disease** clinically or sonographically as non-Cushing's illness will influence the potential false + LDDST or even ACTH stim. The sonogram gives a global perspective of the internal health of the patient to be considered in the Cushing's workup as an assessment of concurrent disease. Is there a concurrent neoplastic process, UTI pancreatitis, mucocele....? Are the adrenals enlarged (Cushing's-PDH, stress, age related or breed variant), or atrophied (iatrogenic Cushing's or adrenal burnout), have asymmetric enlargement (Adrenal tumor, hyperplasia, adenoma, age related variant), or is there vascular invasion (Invasive pheo with false + UA criteria or adenocarcinoma or phrenic thrombosis)? The sonogram answers these questions proactively.

Address & treat concurrent disease first before performing Cushing's testing or testing will be artificially altered increasing false negatives and positives.

3) **LDDST** (0.01 D-Sodium phosphate mg/kg IV **with precise dosing******) (Better screening test but plagued with false + but considered more specific than ACTH stim) Use if there is potential early Cushing's or if adrenal asymmetry present on sonogram suspecting tumor. Use LDDST in cats at a higher dose (0.1 mg/kg IV). **Interpretation LDDST:** Look at 8-hour post first: If > 1.4 = Cushing's. Then look at 4-hour: if > 1.4 or > 50% baseline = Cushing's. 4-hour do then 8-hour spike most consistent with PDH. Flat line high constant curve without dip more consistent with tumor but can be PDH. See attached graph.



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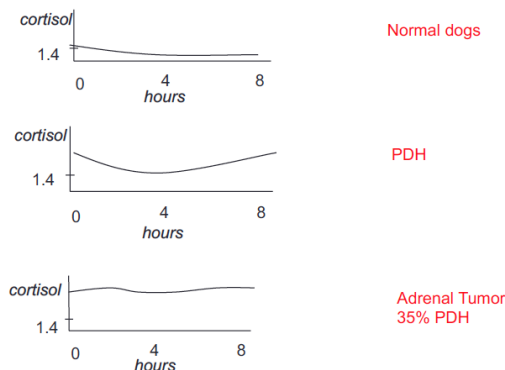
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LDDS



Courtesy: Rebecca Berg DACVIM, DECVIM

4) **ACTH stim.** (Better confirming test but can have false +) Use if the patient “looks” Cushingoid or if bilateral adrenal enlargement is present, or high normal width on sonogram, or if iatrogenic Cushing’s suspected (Cortisone Tx in past). ACTH stim is better for diagnosis of Addison’s, iatrogenic Cushing’s, and Cushing’s therapy monitoring but problematic with initial Cushing’s diagnosis. First dx LDDST is suggested.

5) If **diabetic** then run both LDDST & ACTH stim but stabilize as much as possible first.

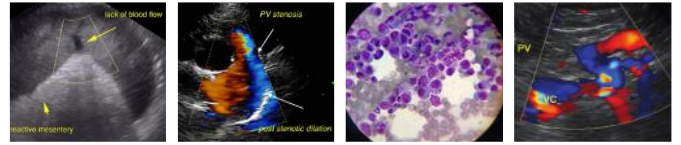
5) Run a **serial blood pressure** in a BP friendly non “white coat effect” atmosphere. Run at least 3 at different times over a few hours or when eating as the patient tends to be calm when eating or give Torbutrol when entering the facility. Cushing’s hypertension is usually 150-180 systolic range while pheochromocytoma range is more often > 180 systolic.

6) **Perform CT** of the pituitary to identify macro adenoma expansion if any lethargy or dullness or other central clinical CNS signs are minimally present. CT for adrenal may be more thorough for adrenalectomy surgical planning if ultrasound views of the CVC were problematic.

7) **Adrenalectomy** for adrenal mass is prescribed then it is essential to stabilize the patient first regarding secondary disease such as organ dysfunction, hypertension, diabetes mellitus, hypernatremia, thromboembolic risk urinary and other infection in order to minimize potential for operative and postoperative complications as they are common in adrenalectomy. Trilostane stabilization therapy for Cushing’s would be the first approach then address surgery and hypertension should be managed ideally < 160 systolic with ace inhibitors, phenoxybenzamine, or amlodipine.

Suggested reading:

Behrend EN, Kooistra HS, Nelson R, et al. Diagnosis of Spontaneous Canine Hyperadrenocorticism: 2012 ACVIM Consensus Statement (Small Animal). J Vet Intern Med 2013;27:1292–1304 .



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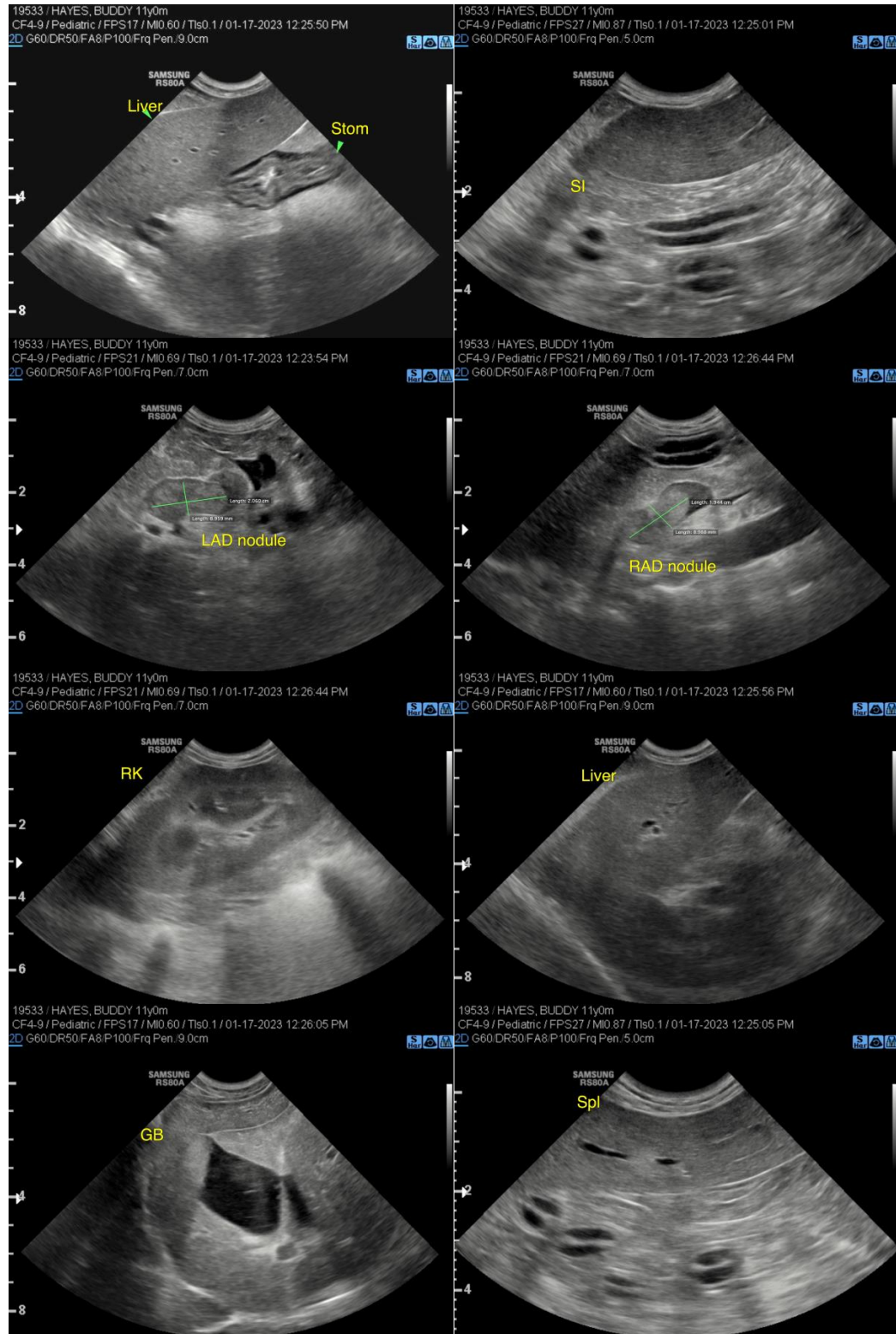
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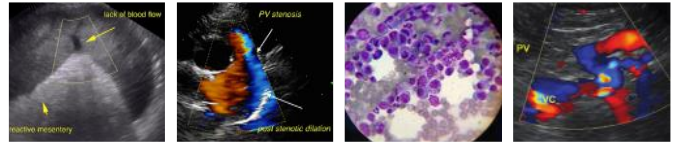
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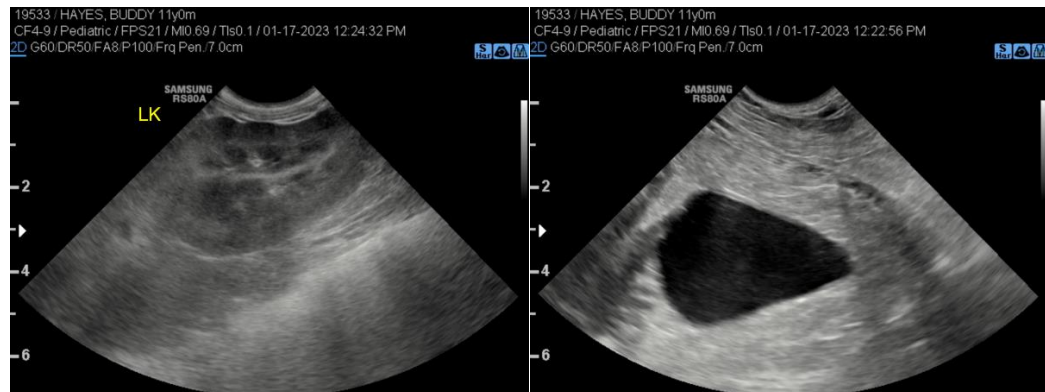
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The information and recommendations provided are based on the images presented by the referring veterinarian/sonographer. No evaluation can be communicated regarding pathology that was not visible in the image/video clips provided.

Thank you for this referral. If the clinical or image interpretation does not parallel your findings or if I can be of any further assistance please contact me.

R. McKenzie Daniel, DVM, DABVP (Canine / Feline Practice)
info@SonoPath.com