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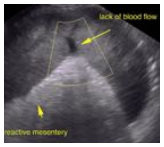
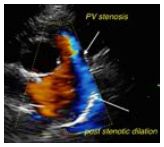
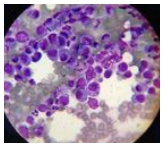
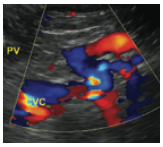

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PATIENT
Lizzy Egense

SPECIES
Canine

BREED
Border Collie Mix

SEX
Spayed female

AGE
12 years

WEIGHT
19.6 kg

INTERPRETED BY
Eric Lindquist, DMV DABVP, Cert. IVUSS

IMAGING PERFORMED BY
Dallas Reynolds LVT

HOSPITAL NAME
Lone Mountain AH

REFERRING VET
Dr. Munoz

INVOICE
43748

DATE
4/6/23

PRESENTING CLINICAL SIGNS

History: Presents initially for skin issues, thinning of hair, pruritus. O reports PU/PD and accidents around the house. Abdomen appears tense and distended. Concerns for Cushing's vs neoplasia vs hepatopathy vs other.
Abnormal PE/Chem/CBC/UA Results: Chem: alt = 142, ast = 98, alp = 987, bun = 40, cpk = 1,453 cbc - nsf UA (voided): usg = 1.025, prot 2+, bacteria (rods) 26-50 UCCR: 23 Xrays: The cardiac silhouette and pulmonary vasculature are normal for size. A mild bronchial pattern is identified throughout the lung fields. The pleural space is within normal limits. The mediastinal structures are unremarkable. The liver is mildly enlarged. The spleen and kidneys are within normal limits. The urinary bladder is small. The stomach contains a large volume of heterogenous, soft tissue opaque material. The small intestines contain gas and soft tissue opaque material and are considered within normal limits for size. Gas and non-formed fecal material is identified within the colon. Adequate serosal margin detail is identified throughout the peritoneal cavity. Assessment: Bronchial pulmonary pattern. This likely represents an aging change. Infectious/inflammatory lower airway disease cannot be ruled out. Correlation with clinical history (if the patient has a history of coughing) would be helpful. Mild hepatomegaly. Differentials for this finding include both benign as well as malignant processes. Depending on clinical impressions, ultrasound evaluation of this region may be helpful. If there is concern for Cushing's disease as a cause for the patient's clinical signs, appropriate blood work testing would also be of benefit. The heterogenous, soft tissue opaque material within the gastric lumen likely represents food. Correlation with clinical history (if the patient has recently eaten) would be helpful. Otherwise unremarkable abdomen.

ULTRASONOGRAPHIC EXAMINATION OF THE ABDOMEN

Urinary System

The **urinary bladder** revealed an apical dorsal polyp that measured 0.9 x 0.37 cm at the dorsal bladder wall. A minor amount of debris was noted in the bladder.

The **kidneys** revealed normal size and structure, corticomedullary definition and ratio for this age. The cortices presented largely uniform texture with normal echogenic relationship to liver and spleen. Medullary structure differed distinctly from the cortex and no evidence of pelvic dilation was present. The capsules were acceptably uniform without significant irregularities.

Adrenal Glands

The **adrenal glands** appeared slightly enlarged and swollen. No evidence of focal capsular expansion or invasion into the phrenic veins was noted. No overt suspicion of neoplasia was noted. This is considered likely a hyperplastic change associated with stress or adrenal endocrinopathy (PDH). If isosthenuria is persistently present and the patient morphologically suggests Cushing's disease then ACTH testing would be indicated. The right adrenal gland measured 0.64 cm. and 1.4 cm at the cranial pole. The left adrenal gland measured 0.97 cm at the caudal pole and 0.83 cm at the cranial pole.

Spleen

The **spleen** revealed mixed, hypoechoic 1.6 cm nodule at the cranial pole with disrupted architecture. Mild splenomegaly was noted.

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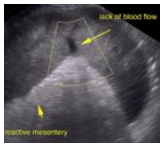
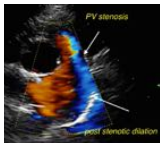
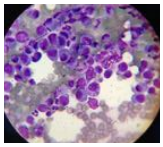
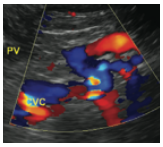

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Liver

Exam of the cranial abdomen demonstrated excessive **liver** size, swollen contour, with conserved uniform architecture. Parenchymal echogenicity was diffusely isoechoic to the spleen and falciform fat. Hyperechoic nodular changes were noted. Occasional parenchymal cyst was noted in the liver. This was minor and measured up to 1.0cm. Minor excessive GB debris was noted with the presence gall bladder dilation and precipitate without the overt formation of mucocele but this may be an issue in the future. This type of liver presentation typically is associated with slow and gradual SAP elevations with low-grade ALT rise. USG-FNA sampling is encouraged if more aggressive LE profiles are present such as ALT > 200 or rapid rise in SAP. These presentations are usually reactive hepatopathies owing to other disease processes either endocrine (Diabetes, Hypothyroidism, Cushing's disease), "antigen surveillance" from the gut/pancreas, or idiopathic breed predisposed progressions.

Gastrointestinal

The **gastrointestinal tract** revealed diffuse, hyperechoic fogging or overlay throughout the small intestine as well as areas of mucosal striations and speckling. This striation + fogging effect appeared to exclusively affect the mucosal layer with the submucosa, muscularis and serosa left in-tact. Reactive mesentery was present associated with the serosa indicative of active inflammation. This is most consistent with protein losing enteropathy/lymphangectasia. Full thickness biopsies or endoscopy guided biopsies would be ideal to confirm. No obstructive disease or obvious suspicion of neoplasia.

Pancreas

The **pancreas** was hypoechoic and irregular with enhanced surrounding mesentery.

ULTRASONOGRAPHIC FINDINGS

Minor lymphangectasia GI pattern.

Concerning splenic nodule. Differentials include round cell neoplasia, hemangiosarcoma, abscessation.

Vacuolar hepatopathy and hepatic nodules.

Given the UA results, UTI is present

Age related renal changes.

INTERPRETATION OF THE FINDINGS & FURTHER RECOMMENDATIONS

Left and right subxiphoid palpation is recommended to assess for any discomfort consistent with pancreatitis. There are multiple issues in this patient. The splenic and hepatic nodules should be defined by FNA. Full urinary work-up and treatment for UTI is indicated avoiding cystocentesis given the bladder polyp as there is a minor potential for emerging carcinoma. Bilateral adrenal hypertrophy would suggest potential Cushing's/PDH. Eventual splenectomy may be appropriate dependent upon aspirate results.

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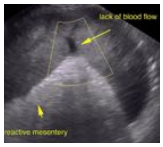
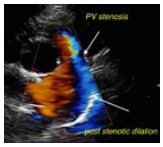
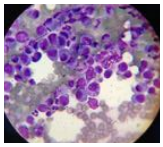
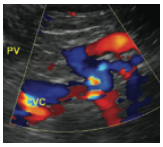

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Efficient & Accurate Cushing's Work up-Lindquist

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

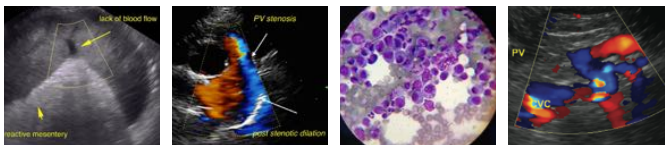
1) **UA:** Repeatable (2-3 urine samples) Urine specific gravity & urine cortisol/creatinine ratio (UCCR): If ***repeatable USG< 10.20 and + UCCR*** move to next step 2.

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). **Interpetation 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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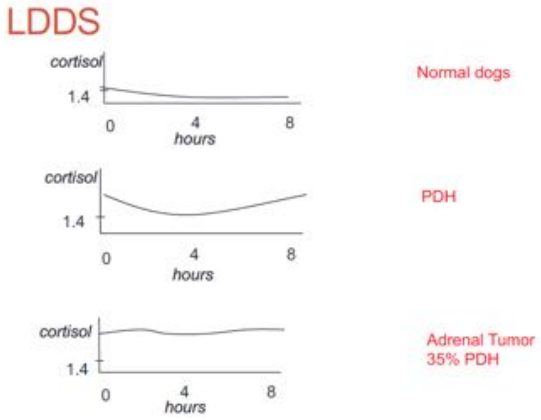

Courtesy: Rebecca Berg DACVIM, DECVIM

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 Addisons, Iatragenic 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 through for adrenalectomy surgical planning if ultrasound views of the CVC were problematic.

7) **Adrenectomy** 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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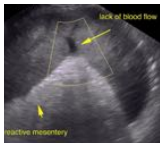

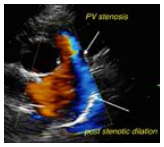

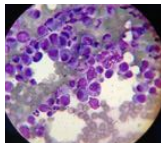
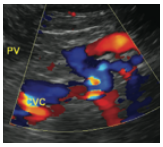

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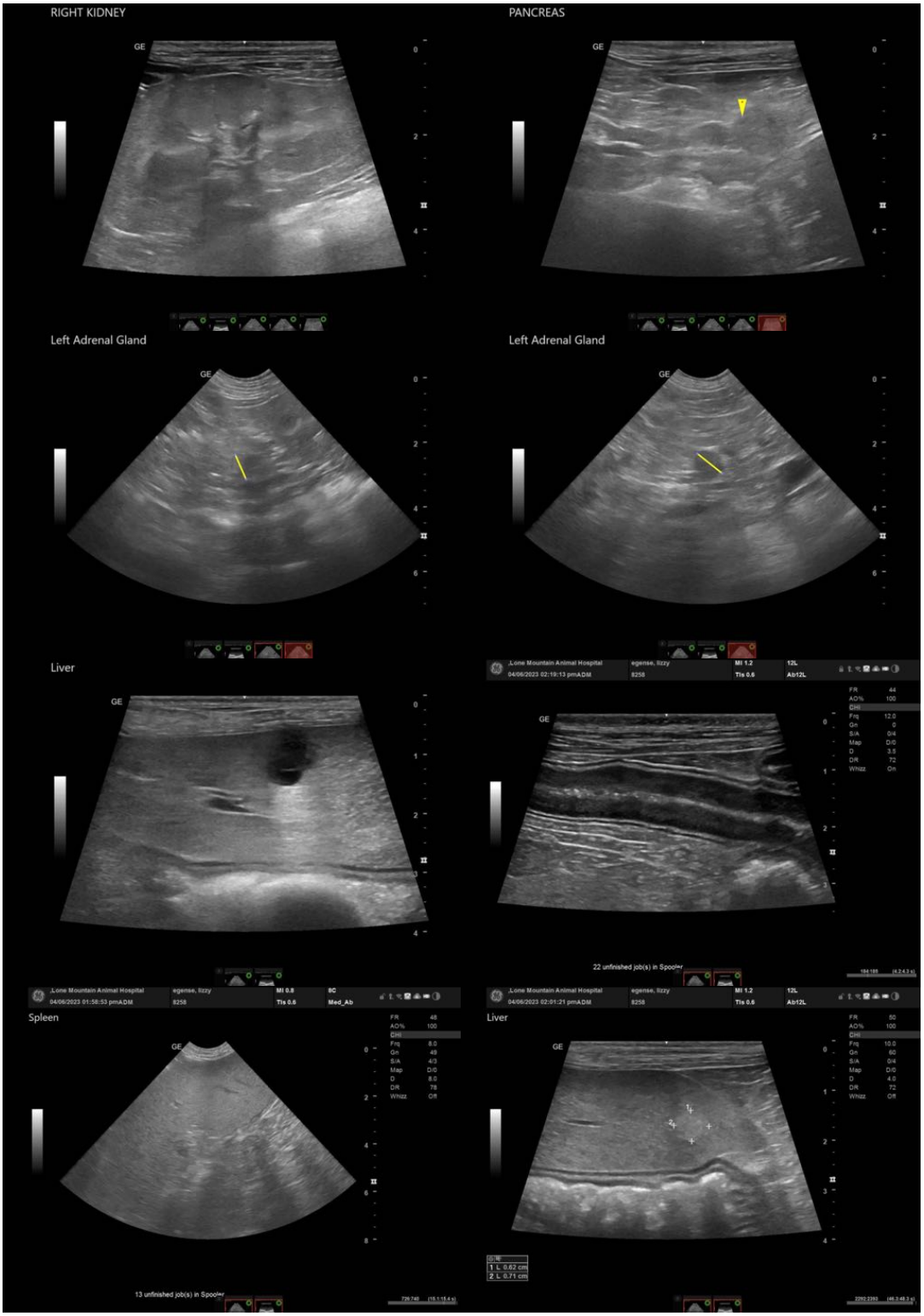

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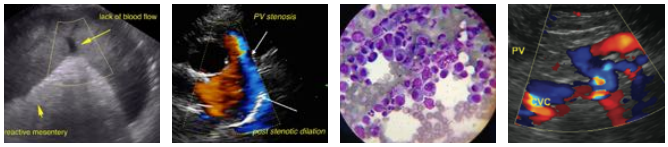

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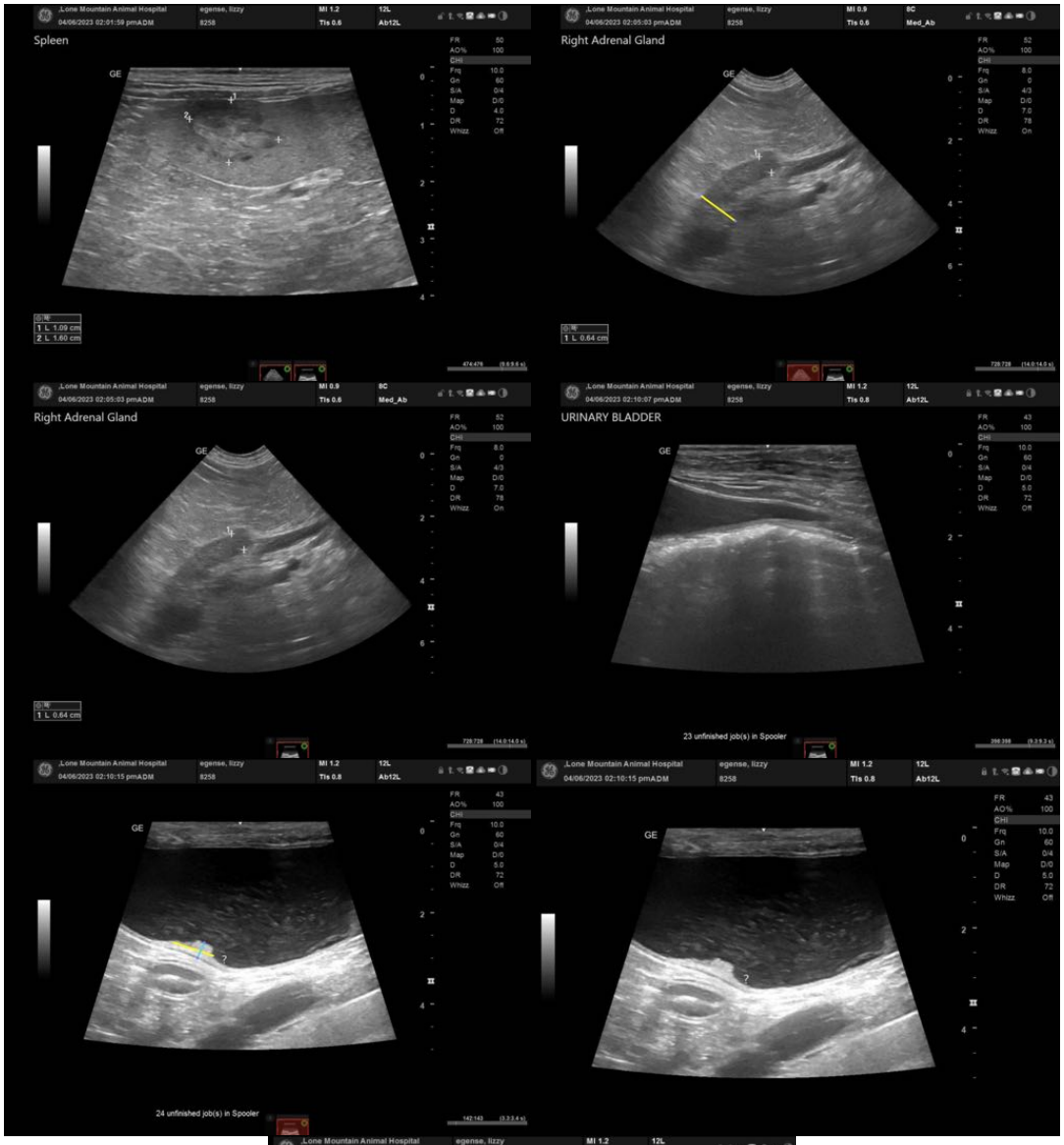

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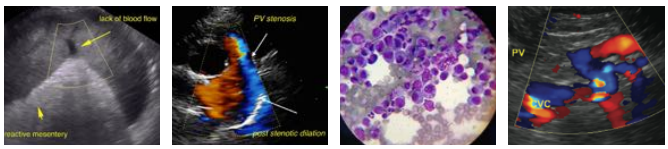

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Thank you for this referral. If the clinical or image interpretation does not parallel your findings or if I can be of any further assistance please contact me.

Eric Lindquist, DMV, DABVP, Cert. IVUSS, CEO of SonoPath.com
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