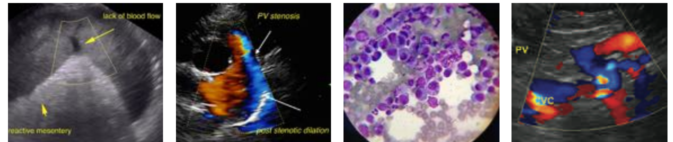

SonoPath.com
1-800-838-4268 info@sonopath.com

PATIENT

Macey Sullivan

SPECIES

Canine

BREED

Husky Mix

SEX

Spayed Female

AGE

11 years

WEIGHT

27.4 lbs

INTERPRETED BY

Eric Lindquist, DMV
DABVP, Cert. IVUSS

IMAGING PERFORMED BY

Dr. Bell

HOSPITAL NAME

Cedarview AH

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INVOICE

31274

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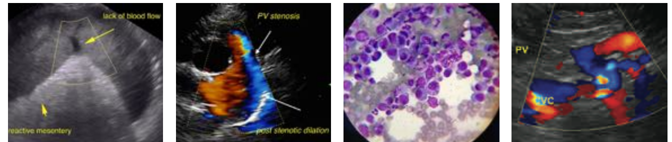
6/27/22

PRESENTING CLINICAL SIGNS

History: Macey is an 11 year old female spayed siberian husky. She presented initially in October of 2021 for decrease appetite and slight increase in thirst/urination. October 2021 Bloodwork showed hyperglycemia - Glucose - 23.2 3.5 - 6.3 mmol/L hyponatremia: Sodium 140 142 - 152 mmol/L Hypochloremia Chloride 98 108 - 119 mmol/L Hyperphosphatasemia ALP 282 5 - 160 U/L Her urine showed the following : Specific Gravity 1.033 Glucose 4+ Ketones 2+ Blood / Hemoglobin 1+ At this time a diagnosis of diabetes was made and she was started on insulin therapy. A more intensive work up including chest rads and abdominal ultrasound was recommended to ensure they was no inciting cause or underlying disease - this was declined at the time. Caninsulin was started at 7.5 units BID. However, her readings continued to show up as "high" on the owners freestyle libre. She was gradually increased to 10 units BID, then to 12 units BID. At that time, her clinical signs seemed to be stable- less PUPD, good energy levels, good appetite and stable weight. She was maintained at this dose for months until some of the clinical signs started to become apparent once more. Urine repeated in January 2022 while clinical signs stable. Specific Gravity 1.019 Glucose 1+ Ketones neg Urine repeated in April 2022 once clinical signs returning. (freestyle libre showing "high" results for 90% of daily readings) Specific Gravity1.045 Urine Protein 1+ Glucose 3+ Ketones neg Given increase in urine glucose, bloodwork was repeated at this time and showed the following: Glucose 16.3 3.5 - 6.3 mmol/L Albumin 26 27 - 39 g/L ALT 154 18 - 121 U/L ALP 233 5 - 160 U/L Amylase 300 337 - 1,469 U/L A follow up UCCR was performed and the result was 34 (borderline - cannot rule out cushings) Given the clinical signs and the bloodwork results - Macey's caninsulin was increased to 15 units BID - she initially did quite well and then one day had a reading of 2 mmol/L. Her dose was decreased at this time to 12.5 units BID and her daily values returned to high. During a recheck appointment, a 1/6 left sided heart murmur was auscultated. An ultrasound was recommended at this time.

ULTRASONOGRAPHIC EXAMINATION OF THE HEART

The echocardiogram in this patient demonstrated normal **left atrial** size based on 3 separate methods of LA evaluation. Trivial **mitral** valve insufficiency was noted. The **left ventricle** presented thicknesses with linear contour and was not dilated nor restricted. The **myocardium** presented normal echogenicity without subjective evidence of significant fibrotic or ischemic disease. **Contractility** of the ventricular walls was adequate and in normal range for this patient evidenced by the fractional shortening measurement and subjective evaluation of the different regions of the myocardium. The **left ventricular outflow** tract demonstrated normal laminar flow and subjective structural integrity. The **right atrium** and auricle revealed normal size, structure and content. No evidence of masses was noted. **Tricuspid** valvular assessment demonstrated adequate linear morphology and kinesis. The **right ventricle** was of normal size (1/3 diameter of LV), chordae structure, myocardial echogenicity and thickness. **Pulmonary outflow** tract assessment revealed normal valve structure, laminar flow, and diameter (approx.1:1 pa/ao ratio). No visible **pericardial** or free pleura fluid was noted. The cranial **mediastinum and pericardial and extra-cardiac regions** were free of masses in the visible window.



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CANINE CARDIAC PARAMETERS	MR VMAX (m/s)	TR VMAX (m/s)	LA/AO (Boon method)	LA/AO (Heart Base; Swe)	FS (%)	EF (%)	EPSS (cm)
NORMAL PARAMETER	4.5-5.5	<2.7	1.3	<1.3	28-40	40-100	<0.6
PATIENT	NM	NM	1.15	1.3			0.1
CANINE CARDIAC PARAMETERS	**HR (BPM)**	**AV VMAX (m/s)**	**PV MAX (m/s)**	**BODY WEIGHT**	**LA 2D short axis Base view (cm)**	**LVIDd Avg; 2D and m-mode short axis (cm)**	**LVIDs Avg; 2D and m-mode short axis (cm)**
NORMAL PARAMETER	50-100	0.7-1.7	0.7-1.6				
PATIENT		NM	NM	27.4 lbs	3.45	2.83	

ULTRASONOGRAPHIC EXAMINATION OF THE ABDOMEN

Urinary System

The **urinary bladder**, trigone, and pelvic urethra presented normal thicknesses and normal tone. The ureters were not visible which is normal. No uroliths or sediment were visualized and anechoic urine was present. No evidence of inflammatory or neoplastic changes was noted. Ureteral papillae were normal.

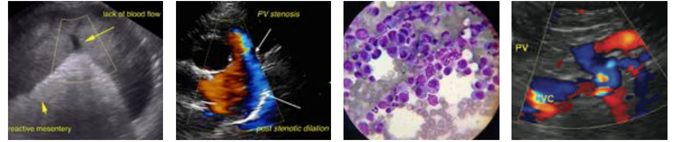
The **kidneys** revealed normal size and structure, corticomedullary definition and ratio for this age. The cortices presented largely uniform texture with normal echogenic relationship to liver and spleen. Medullary structure differed distinctly from the cortex and no evidence of pelvic dilation was present. The capsules were acceptably uniform without significant irregularities. The left kidney measured 6.0 cm.

Adrenal Glands

The left **adrenal gland** was slightly enlarged in the caudal pole and measures 0.94 cm and the cranial pole measures 0.6 cm. The right adrenal gland was mildly heterogenous and measured 0.8 cm at the cranial pole and 0.6 cm at the caudal pole.

Spleen

The **spleen** presented a smooth homogeneous parenchyma hyperechoic to liver and renal cortical parenchyma. A focal, hypoechoic nodule was noted and measured 0.7 cm with mild disruption of architecture. Other nodular changes were noted in the spleen and were non-disruptive. The capsule was smooth without noticeable expansion or deviation from within the spleen or adjacent pathology.



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The splenic vasculature demonstrated normal volume without signs of congestion or thrombosis. No sonographic evidence of acute or chronic inflammatory, neoplastic, or infarctual changes was noted.

Liver

The **liver** images from right and left intercostal as well as subcostal views revealed subjectively normal liver size, contour, and structure. Some age-related parenchymal remodeling was noted but likely not clinically significant at this time. Vascular and biliary tracts were of normal volume and no evidence of congestion was noted. The gallbladder was mildly over distended with suspended and dependent debris, yet not to the level of emerging mucocele. However, the sludge appears to be mildly excessive. No adjunctive inflammation was noted.

Gastrointestinal

Examination of the **gastrointestinal tract** revealed a stomach and intestine free of stasis, of normal wall thickness, acceptable curvilinear mural detail, and peristaltic activity. Small and large intestine demonstrated normal luminal chyme and stool consistency respectively. No obstructive or overt infiltrative disease was noted. No associated abnormal lymphatic activity was noted.

Pancreas

The base and limbs of the **pancreas** were observed to be largely isoechoic to surrounding omental fat. Pancreatic duct and capsular contour were acceptably normal and parenchyma respected normal curvilinear patterns. No overt evidence of active inflammatory or neoplastic disease was noted.

ULTRASONOGRAPHIC FINDINGS

Largely normal echocardiogram with trivial mitral valve insufficiency, compensated.

Splenic nodule.

Slight nodular left adrenal gland.

INTERPRETATION OF THE FINDINGS & FURTHER RECOMMENDATIONS

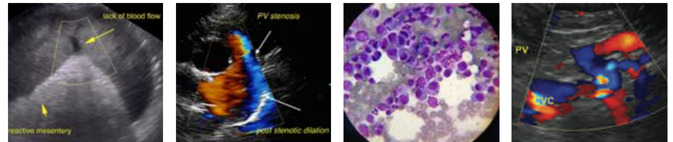
FNA of the splenic nodule is indicated. Treatment of the diabetic state is warranted. There is no overt evidence of organ disease that would be responsible for diabetic dysregulation. PDH/Cushing's is possible given the mildly enlarged left adrenal gland. The right adrenal gland is normal in size, yet heterogenous.

Potential Causes of Diabetic Dysregulation

This is a suggestive checkoff list when faced with an unregulated diabetic patient:

UTI

Dietary indiscretion/intolerance



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Pancreatitis

Hyperthyroidism/hypothyroidism

Exogenous steroids (including topical eye meds)

Cushing's

Acromegaly

Owner compliance

Insulin quality issues

Antibodies to insulin

Underlying Neoplasia

Diffuse liver disease

Efficient & Accurate Cushing's Work up-Lindquist

Notes regarding Cushing's Clinical Presentations:

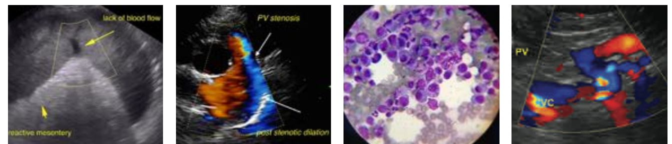
Nearly all Cushing's dogs have SAP elevations and true PU/PD (USG < 1.025) and most are polyphagic. Cushing's dogs are > 6 years and usually > 9 years old, usually have poor skin coats, body scores > 3/5, and are usually sedentary animals.
Its important to remember that Cushing's dogs usually look and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



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3) **LDDST** (0.01 D-Sodium phosphate mg/kg IV) (Better screening test but plagued with false +) 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).

OR

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).

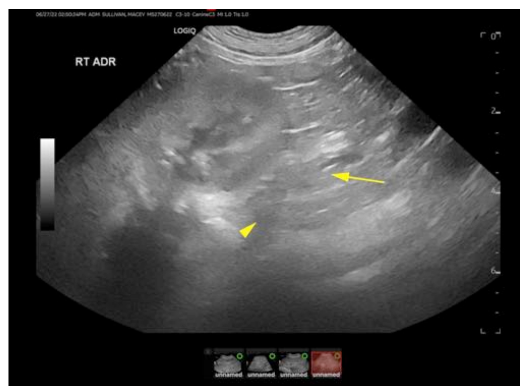
5) If **diabetic** then run both LDDST & ACTH stim.

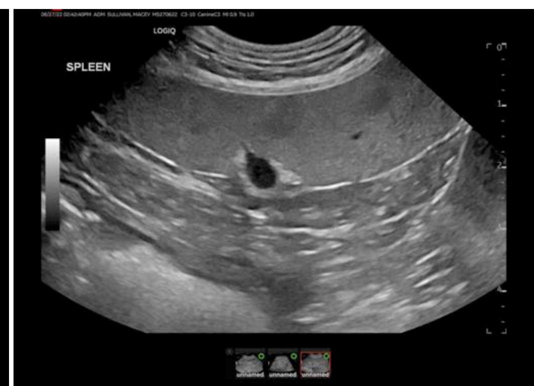
5) Run a **serial blood pressure** in a BP friendly non "white coat effect" atmosphere. Run at least 3 at different times over a few hours or when eating as the patient tends to be calm when eating or give Torbutrol when entering the facility.

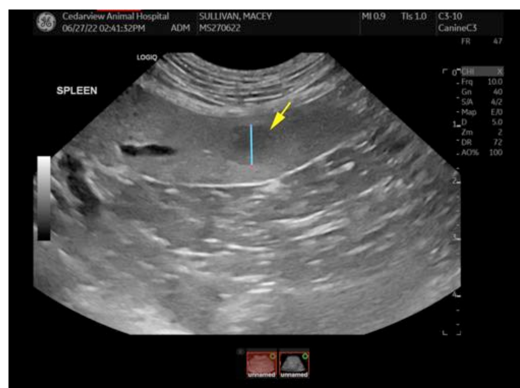
6) **Perform CT** of the pituitary to identify macro adenoma expansion if any lethargy or dullness or other central clinical CNS signs are minimally present.

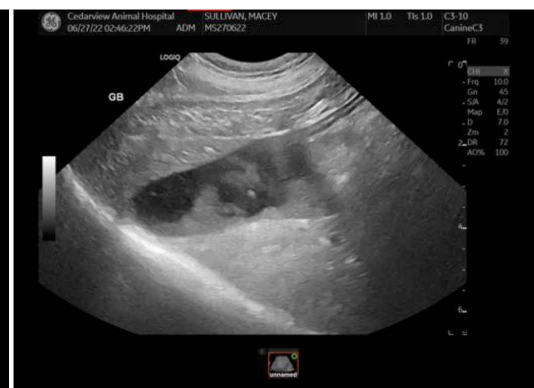
Suggested reading:

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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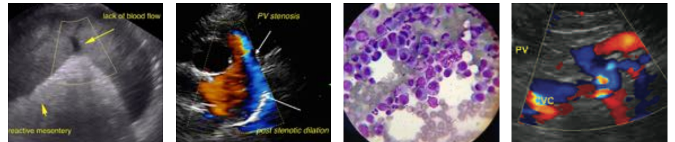

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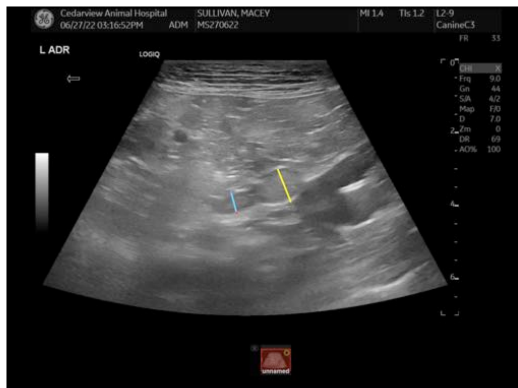

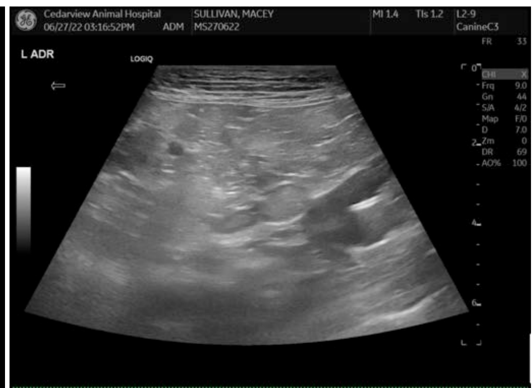

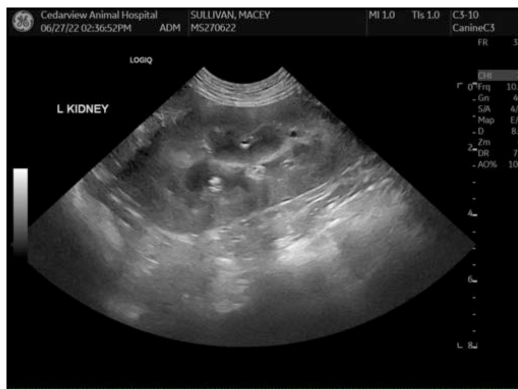

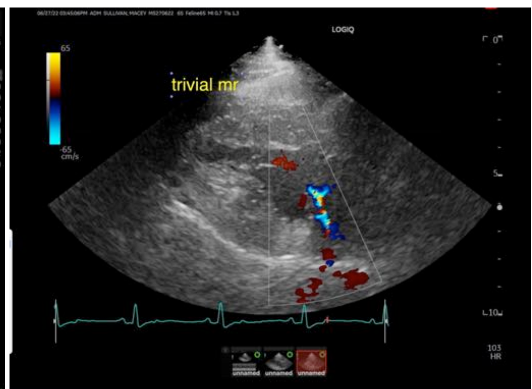

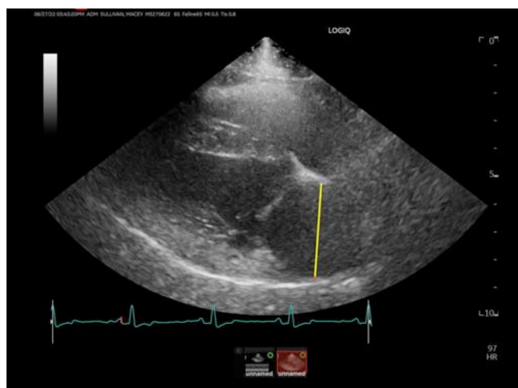

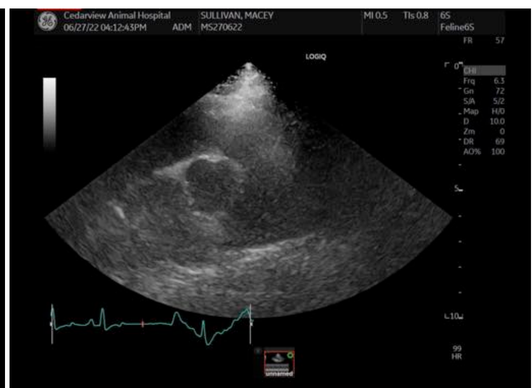

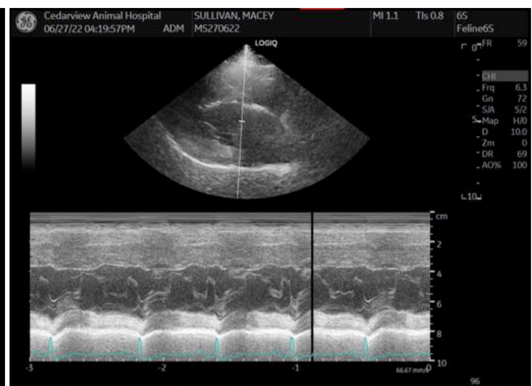

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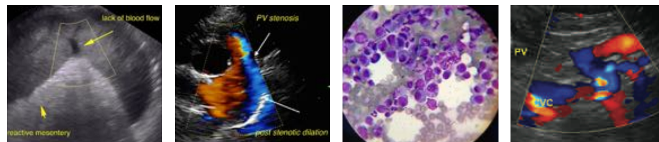

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The information and recommendations provided are based on the images presented by the referring veterinarian/sonographer. No evaluation can be communicated regarding pathology that was not visible in the image/video clips provided.

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.

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