**PATIENT**

Stirling Eggers

SPECIES

Canine

BREED

Miniature Schnauzer

SEX

Neutered Male

AGE

14 Years

WEIGHT

19.4 Pounds

PRESENTING CLINICAL SIGNS

Presented at ER on 7/29/22 for coughing, syncope with resulting into seizures. Treated with Levetiracetam 100mg/ml and released. Presented at RDVM on 8/1/22 with continued coughing and syncope. 5/6 left side systolic heart murmur was noted on exam. Current medications: 1. Pimobendan 2. Enalapril 3. Cardiac and hepatic supplements 4. Trazodone PRN 5. hydrocodone
Abnormal PE/Chem/CBC/UA Results: BW revealed elevated liver enzymes.

ULTRASONOGRAPHIC EXAMINATION OF THE HEART

CANINE CARDIAC PARAMETERS	MR VMAX (m/s)	TR VMAX (m/s)	LA/AO (Boon method)	LA/AO (Heart Base; Swedish)	FS (%)	EF (%)	EPSS (cm)
NORMAL PARAMETER	4.5-5.5	<2.7	1.3	<1.6	28-40	40-100	<0.6
PATIENT	5.45	2.4		2.21	36	NM	0.40
CANINE CARDIAC PARAMETERS	HR (BPM)	AV VMAX (m/s)	PV MAX (m/s)	BODY WEIGHT (kg)	LA (2D long 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	209 - 217	1.21	0.65	8.82	4.52	3.95	2.54

Adapted from June Boon, Veterinary Echocardiography, 1998
Sisson D et al. JVIM 1991; 5: 232, and Jacobs et al. Am J Vet Res 1985; 46:1705

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ACVIM**IMAGING PERFORMED BY**

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Radiographs

Marked cardiomegaly, with very severe left atrial and left ventricular enlargement and dorsal deviation of the trachea

Mild compression of the mainstem bronchus by the left atrium

Pulmonary congestion is suspected, in addition to pleural fissure lines.

Mineralizations of the lungs are visualized.

A moderate to severe peribronchiolar and interstitial lung pattern are present.

Aerophagia

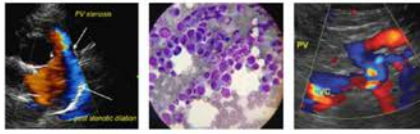
Hepatomegaly

Electrocardiogram (lead II, AliveCor)

A large amount of movement artifact is present

Tachycardia

Irregularly irregular rhythm

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Absence of P waves, in addition to AV dissociation.

Electrical alternans

SPECIES

Canine

Supraventricular tachycardia with occasional right sided premature ventricular contractions with fusion beats

A longer ECG recording is required to further classify the ECG changes

BREED

Miniature Schnauzer

Echocardiographic findings*Mitral valve***SEX**

Neutered Male

- Moderate to marked thickening and irregularity of both leaflets, septal worse than posterior; consistent with myxomatous degeneration

- Severe prolapse of both leaflets.

AGE

14 Years

- Ruptured chordae tendineae (septal leaflet) with flail leaflet in certain views

- Marked mitral regurgitation.

- Severe left auricular enlargement.

WEIGHT

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- Rounding of the interventricular septum, i.e. left ventricular enlargement is present

- Marked increase of LA: Ao ratio

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- LA normalized for BW (LAN = 2.1); very severe enlargement/dilation

- LVIDd normalized for BW (LVIDND = 2.1); marked dilation

- LVIDs normalized for BW (LVIDNs = 1.28); mild enlargement

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Aortic valve

- No abnormalities

- Mild to moderate aortic insufficiency

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Tricuspid valve

- Moderate thickening and irregularity of both leaflets; consistent with myxomatous degeneration

- Severe prolapse of septal leaflet causing a posterior TR jet

- Moderate to severe (divergent jets) tricuspid regurgitation.

- No right ventricular or atrial enlargement.

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Pulmonic valve

- No abnormalities

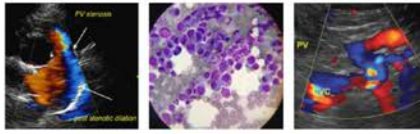
- No pulmonary insufficiency.

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- Main pulmonary artery within normal limits.
- Pulmonary artery - bifurcation, no abnormalities.

Other

- No signs of pericardial or pleural effusion, however, pleural effusion confirmed on abdominal ultrasound
- No evidence of pulmonary edema.
- Pulmonary veins: dilation noted.
- No obvious signs of a mass.

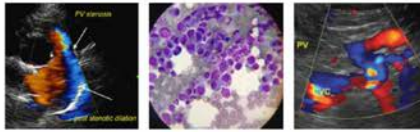
CARDIAC FINDINGS

- Myxomatous degeneration of the mitral (severe) and tricuspid (moderate) valves, ACVIM stage C, with very severe left atrial dilation and left ventricular enlargement. A ruptured chordae tendinae is present. Signs of congestive heart failure are suspected based on physical exam findings and radiographs.

INTERPRETATION OF THE CARDIAC FINDINGS & FURTHER RECOMMENDATIONS

Suggestions/recommendations include:

- Evaluation of arterial blood pressure
- pimobendan (Vetmedin) at a dose of 0.25-0.30 mg/kg PO every 12 hours. If he has a sensitive GI system, the dose should be started at 0.10 mg/kg PO every 12 hours for 3 days prior to increasing to the full dose. Administer with a small amount of food to decrease nausea.
- Discontinue levetiracetam (slowly wean the drug over 1-2 weeks). Seizure activity likely due to hypoxia.
- furosemide 2 mg/kg PO every 12 hours for 3-5 days, then decrease by 25-50% every 3-5 days. Goal: find minimum dose that is effective in controlling cough.
- spironolactone is strongly recommended to help decrease myocardial fibrosis, help treat ascites (more effective than furosemide) and help decrease the dose of furosemide required to treat pulmonary edema.
- ACEI: enalapril or benazepril twice a day. Benazepril ideal if decreased renal function
- trazadone: Discontinue (contraindicated in humans with heart disease)
- gabapentin recommended if required for anxiety and/or Composure Pro (VetriScience)
- hydrocodone or codeine for cough
- An antiarrhythmic is not necessary

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- Monitoring of the resting (sleeping) respiratory rate (RRR) is highly recommended once a day. The RRR should NOT EXCEED 30 breaths per minute (bpm). If the respiratory rate is greater than 30 bpm, or if there is a gradual increase (over a day or two) toward 30 bpm, the patient should be evaluated immediately for congestive heart failure and the appropriate treatment initiated.
- Other clinical signs clients should monitor for include coughing (particularly at night), fatigue, lethargy, decreased exercise tolerance (i.e., not being able to walk for as long before becoming tired, or "running out of breath" while playing, or going up and down stairs, as well as syncope (collapsing or fainting spells). Restlessness, or agitation during the night, or being unable to find a comfortable position to sleep are also very common clinical signs.
- Moderate salt restriction is suggested (less than 0.4 – 0.5 grams/1000 kcal of food). Monitor salt content in treats. Note, if decreased appetite, increase salt to 0.9 grams/1000 kcal of food, but will likely require increased diuretic dose
- Omega-3 fatty acids may be helpful (EPA = 40 mg/kg/day and DHA = 25 mg/kg/day); gradual up-titration of the dose is suggested to decrease risk of gastrointestinal effects. However, *they should not be introduced at the same time as other medications.*
- Non-steroidal anti-inflammatories should be used judiciously for treatment of osteoarthritis, however, comfort of the patient far outweighs potential risks. Multimodal therapy, such as gabapentin, Cartrophen and supplements, as well as laser therapy, etc. may be used in conjunction with NSAIDs to decrease their dose.
- Re-evaluation of blood pressure, CBC and serum biochemical profile, including a SDMA, is suggested in 7-10 days.
- Monitor circumference of the abdomen for recurrence of ascites. May require intermittent abdominocentesis.
- Stirling is a complicated patient, and although some treatment recommendations have been described, a consultation is suggested in order to describe all possible options in further detail.

ULTRASONOGRAPHIC EXAMINATION OF THE ABDOMEN**Urinary System**

The **urinary bladder** is adequately distended with anechoic contents. The wall is smooth and regular. No abnormalities are noted with the trigone or proximal urethra, and there is no evidence of sediment, cystoliths, polyps or a mass.

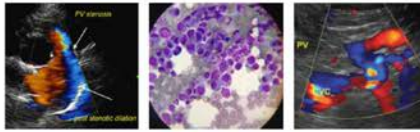
The **prostate** is homogenous and measures 1.55 cm; within normal limits for a neutered male.

Kidneys

The **left kidney** measures 4.76 cm. The capsule is smooth. A loss of the normal definition of the cortico-medullary junction is present. Mineralizations and small nephroliths of the diverticulae and pelvis are present, without evidence of pyelectasia. An accumulation of intrapelvic fat is noted. Blood flow is within normal limits. The surrounding mesentery is not hyperechoic.

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The **right** kidney measures 4.79 cm. Findings are similar to the left kidney.

Aortic bifurcation/trifurcation No abnormalities observed.

Adrenal Glands**SPECIES**

Canine

The **left** adrenal gland measures 0.62 cm at the cranial pole, 0.50 cm at the caudal pole and 2.11 cm in length. No abnormalities are noted with the gland's overall architecture, echogenicity or echotexture. The phrenico-abdominal vein and surrounding vasculature and mesentery are unremarkable.

BREED

Miniature Schnauzer

The **right** adrenal gland measures 0.77 cm at the cranial pole, 0.40 cm at the caudal pole and 2.27 cm in length. The cranial pole is enlarged, however, a well-defined mass or nodule is not visualized. No abnormalities are noted with the gland's overall architecture, echogenicity or echotexture. The phrenico-abdominal vein and surrounding vasculature and mesentery are unremarkable.

SEX

Neutered Male

Spleen

Splenomegaly, with a severe amount of ascites surrounding the organ. It is within normal limits in size, architecture, echotexture, and echogenicity. The capsule is smooth. No abnormalities are observed with its vasculature, i.e. congestion and thrombi are not identified.

AGE

14 Years

Liver

The liver appears "congested" and swollen, however, it is not overtly enlarged. It is homogeneous and within normal limits in echogenicity. The mesentery surrounding the liver is severely hyperechoic. There are no obvious signs of hepatomegaly and its borders are smooth and sharp. Focal lesions are not observed and no abnormalities are noted with the hepatic vessels.

WEIGHT

19.4 Pounds

The gallbladder (GB) is moderately distended with a moderate to large amount of free floating, gravity-dependent and inspissated echogenic material (sludge). The GB wall is within normal limits in thickness and echogenicity. The portions of the cystic and/or common bile ducts observed are not dilated or tortuous, i.e. there are no signs of an obstruction. The parenchyma surrounding the GB is hyperechoic.

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Gastrointestinal

A very large amount of gas is present within the lumen of the stomach. The submucosa is more prominent than usual. Edema of the wall layers is suspected with a concomitant ileus.

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Duodenum: wall thickness is within normal limits and the definition of the wall layers is preserved.

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Jejunum: wall thickness is within normal limits and the definition of the wall layers is preserved in the majority of the bowel. The submucosa is more prominent in many of the segments. The definition of the submucosa is poorly defined in one of the segments in the cranial to mid-abdomen. Stippling of the mucosa of multiple segments is also noted. Hyperechoic, granular ingesta and fluid are present in the lumen.

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The colonic wall is not thickened and mural detail is considered normal. Gas and formed stools are present in the colon.

Pancreas**INVOICE**

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No overt abnormalities are observed with the architecture, contours, echogenicity or echotexture of the pancreas. There is no evidence of hyperechogenicity of the surrounding mesentery, i.e., signs of active pancreatitis are not present.

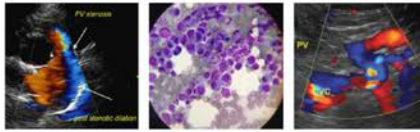
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Other

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Lymph nodes No abnormalities are observed

Abdominal effusion

A scant amount of anechoic effusion is visualized between the diaphragm and liver, as well as between loops of bowel, and surrounding the kidneys. A small to moderate amount of ascites is observed in the caudal abdomen surrounding the urinary bladder. A large amount of ascites is noted surrounding the spleen and liver, however, the fluid is echogenic in this region.

Pleural effusion is noted via the abdomen.

ABDOMINAL FINDINGS

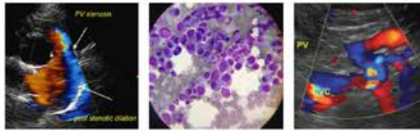
- **Kidneys:** The nephroliths and mineralizations observed may be genetic and/or diet related. They may also be due to degenerative changes. There are no signs of an obstruction.
- **Adrenal glands:** bilateral adrenomegaly likely due to hyperplasia secondary to stress/chronic illness. Pituitary dependent hyperadrenocorticism is less likely unless other clinical signs suggestive of the disease.
- **Splenomegaly** and **hepatomegaly** are attributed to congestion secondary to congestive heart failure.
- **Gastrointestinal tract:** Changes suggestive of edema due to congestive heart failure. Underlying inflammation may also be present.
- **Ascites** and **pleural effusion** are attributed to congestive heart failure

INTERPRETATION OF THE ABDOMINAL FINDINGS & FURTHER RECOMMENDATIONS

Please refer to the echo report for recommendations.

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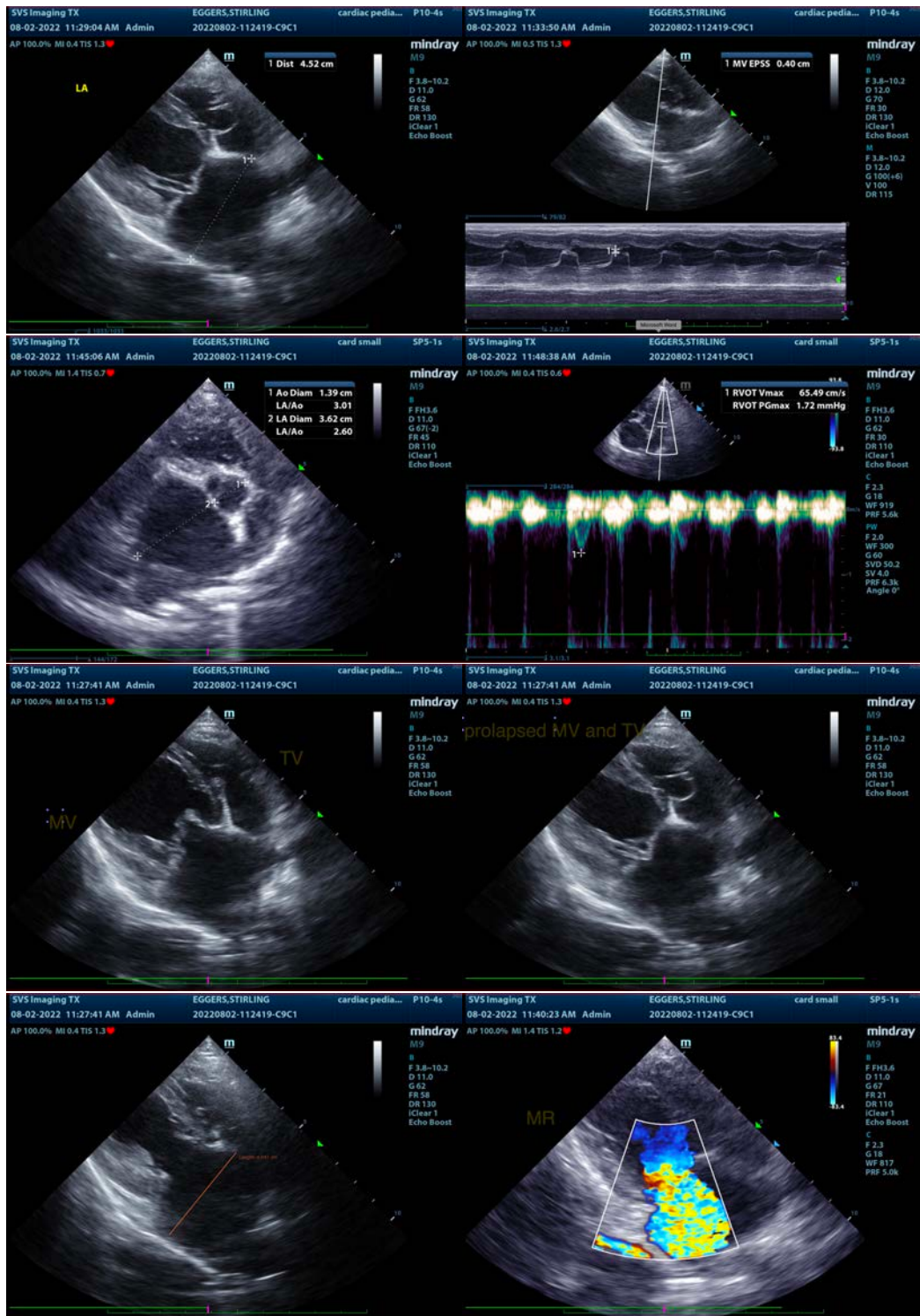
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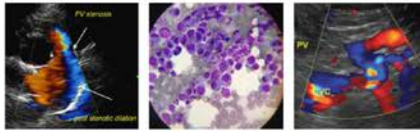
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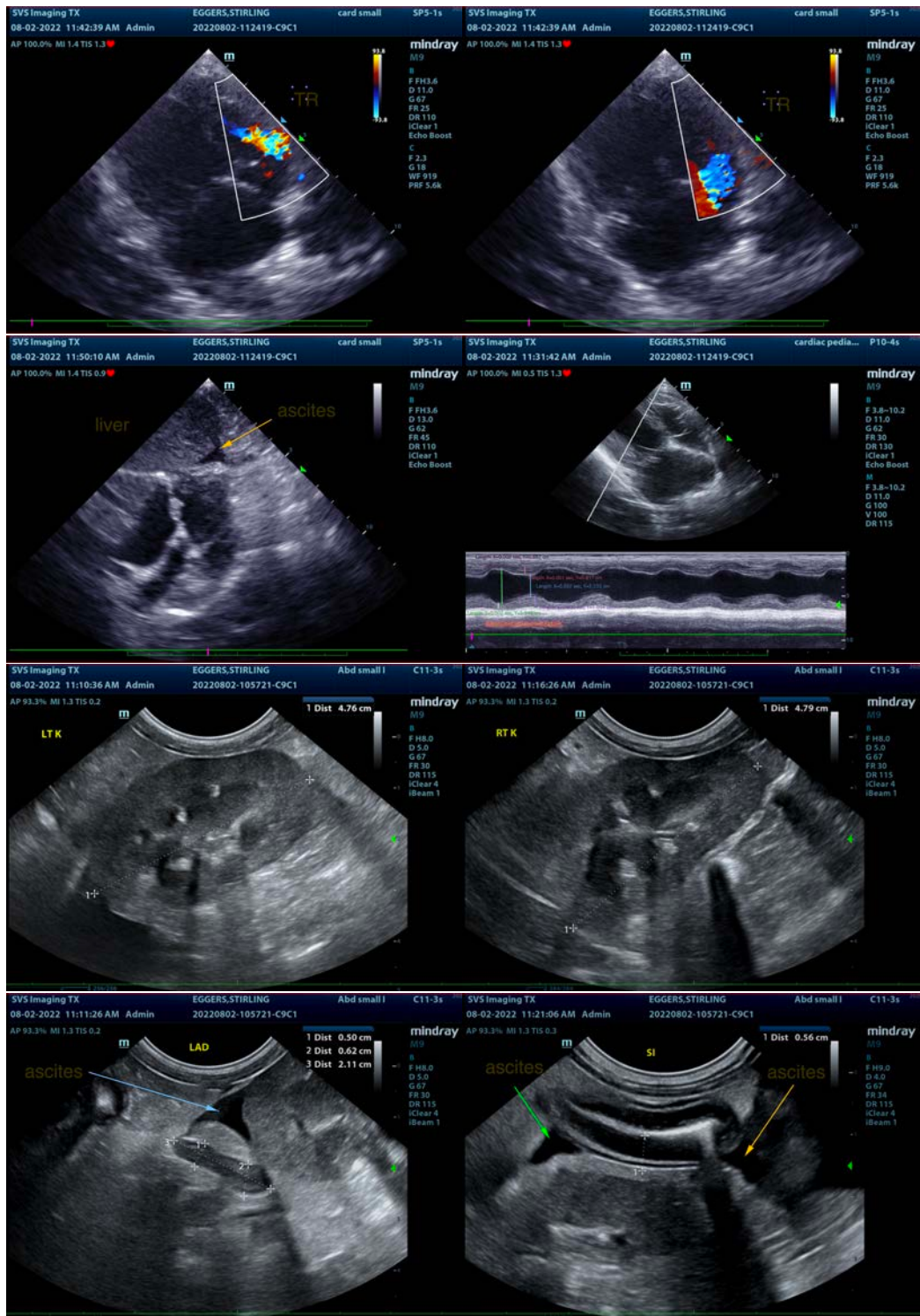
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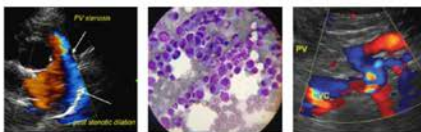
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The information and recommendations provided are based on the images presented by the referring veterinarian/sonographer. No evaluation can be communicated regarding pathology that was not visible in the image/video clips provided.

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.

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