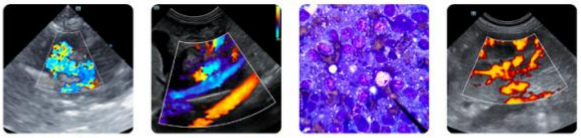

PATIENT

Brody Renz

SPECIES

Canine

BREED

Husky Mix

SEX

Neutered Male

AGE

8 Years

WEIGHT

104 Pounds

INTERPRETED BY

Eric Lindquist, DMV, DABVP (Canine & Feline), Cert. IVUSS

IMAGING PERFORMED BY

Vncent Ravancho, CVT

HOSPITAL NAME

Legacy AH

REFERRING VET

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INVOICE

36153

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PRESENTING CLINICAL SIGNS

- Elevated BNP
- Pre-Sx eval of heart
- Met check in abd
- MCT removal
- Abnormal PE/Chem/CBC/UA Results: BNP 2125

ULTRASONOGRAPHIC EXAMINATION OF THE HEART & ABDOMEN

CANINE CARDIAC PARAMETERS	MR VMAX (m/s)	TR VMAX (m/s)	LA/AO (M-Mode)	LA/AO (Heart Base; Swe)	FS (%)	EF (%)	EPSS (cm)
NORMAL PARAMETER	4.5-5.5	<2.7	1.3	Up to 1.6	28-40	40-100	<0.6
PATIENT	--	--	1.0	1.3	40	72	0.48
CANINE CARDIAC PARAMETERS	**HR** (BPM)	**AV VMAX** (m/s)	**PV MAX** (m/s)	**BODY WEIGHT** (lbs)	**LAD** LA MAX 4 Chamber	**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	109	1.20	.75	104 lbs	4.2	2.9	--

Cardiac Presentation

The echocardiogram in this patient demonstrated normal **left atrial** size based on 3 separate methods of LA evaluation. The cranial and caudal **mitral** valve leaflets presented normal linear structure, extension in systole, and union in diastole with normal kinesis. 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. Minor **tricuspid** insufficiency was noted. 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

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pericardial or free pleura fluid was noted. The cranial **mediastinum and pericardial and extra-cardiac regions** were free of masses in the visible window.

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 were noted. Ureteral papillae were normal. The pelvic urethra was imaged 2.0 cm beyond the cystourethral junction.

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 right kidney measured 6.5 cm. The left kidney measured 6.5 cm.

Adrenal Glands

Both **adrenal glands** were visualized and recognized as having normal shape, size, position and echogenicity for this breed. The phrenic vasculature, glandular echogenicity and detail were unremarkable. Capsule, cortex, and medullary definition were normal for this age patient. The left adrenal gland measured 2.0 cm x 0.5 cm. The right adrenal gland measured 0.9 cm at the cranial pole and 0.7 cm at the caudal pole.

Spleen

The **spleen** presented a smooth homogeneous parenchyma hyperechoic to liver and renal cortical parenchyma. The capsule was smooth without noticeable expansion or deviation from within the spleen or adjacent pathology. The splenic vasculature demonstrated normal volume without signs of congestion or thrombosis. No sonographic evidence of acute or chronic inflammatory, neoplastic, or infarctual changes were noted. The spleen was folded upon itself.

Liver

The **liver** images submitted revealed subjectively normal liver size, contour, and structure. Parenchymal echogenicity was naturally coarse and hypoechoic to the spleen. Vascular and biliary tracts were of normal volume with no evidence of congestion. The gallbladder presented acceptably thin walls with primarily anechoic content. The cystic and common bile ducts were normal. No pathological hepatic lymphadenopathy was evident. No overt structural evidence of inflammatory, infiltrative or regenerative pathology was evident.

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

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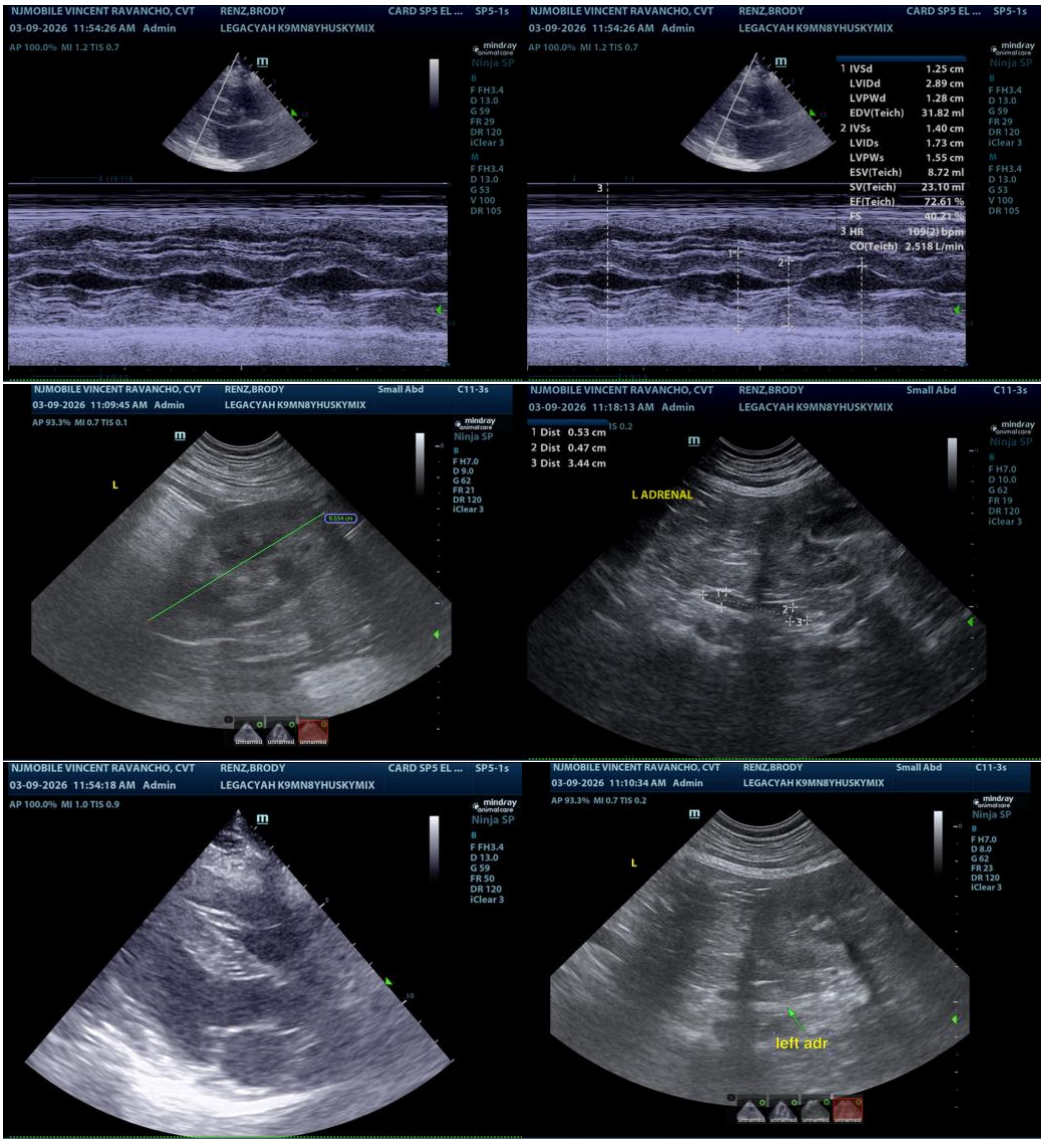
The base and limbs of the **pancreas** were observed to be largely isoechoic to surrounding omental fat. Pancreatic duct and capsular contour were acceptably normal and parenchyma respected normal curvilinear patterns. No overt evidence of active inflammatory or neoplastic disease was noted.

ULTRASONOGRAPHIC FINDINGS

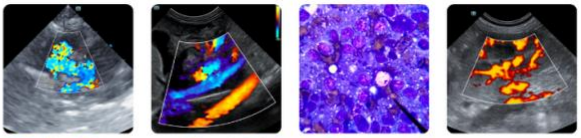
- Structurally unremarkable abdomen
- Splenic folding, normal positional variant
- Normal echocardiogram with minor tricuspid insufficiency

INTERPRETATION OF THE FINDINGS & FURTHER RECOMMENDATIONS

No evidence of primary or metastatic disease.



New Jersey Mobile
FUELED BY SONOPATH VETERINARY ULTRASOUND



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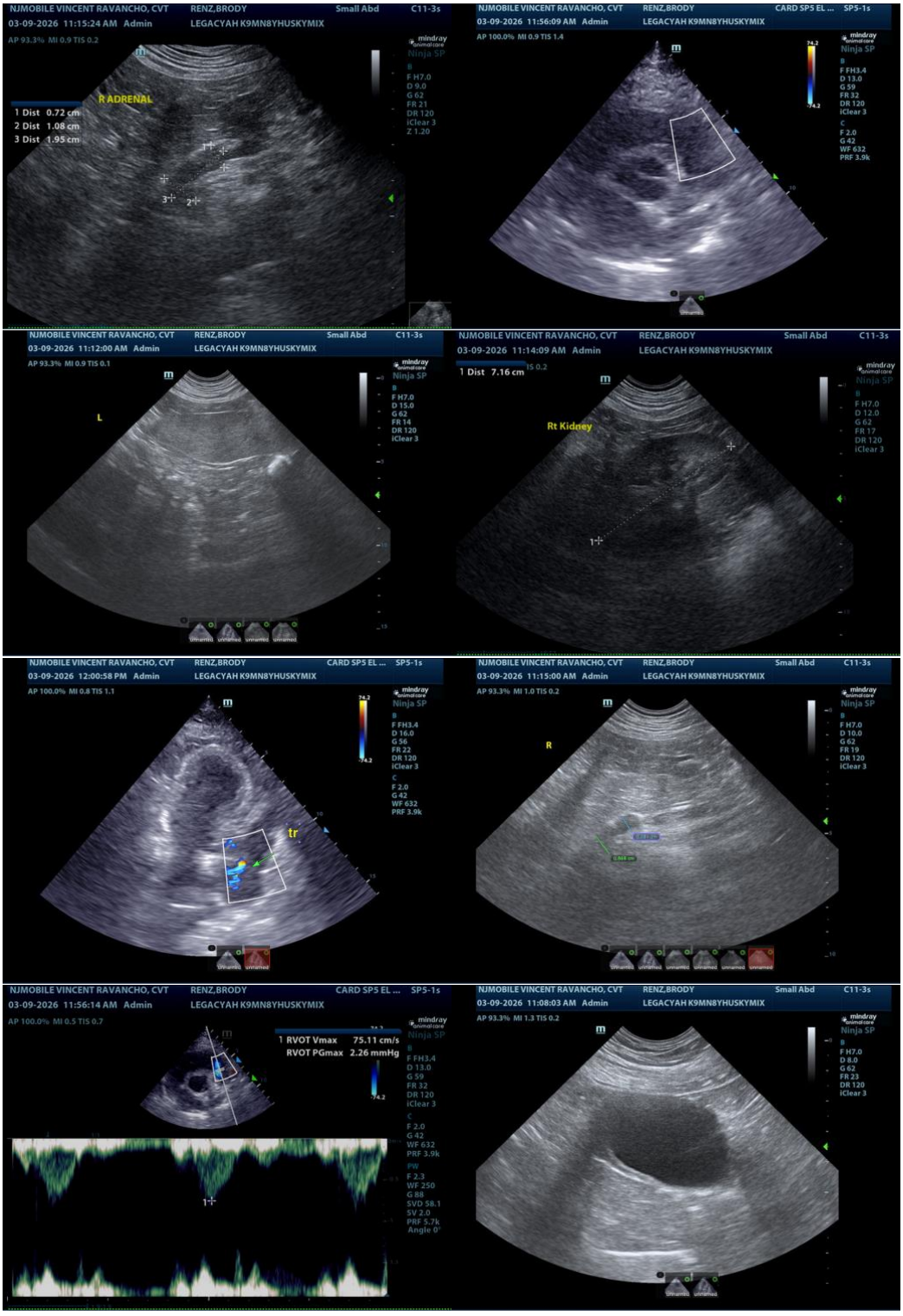

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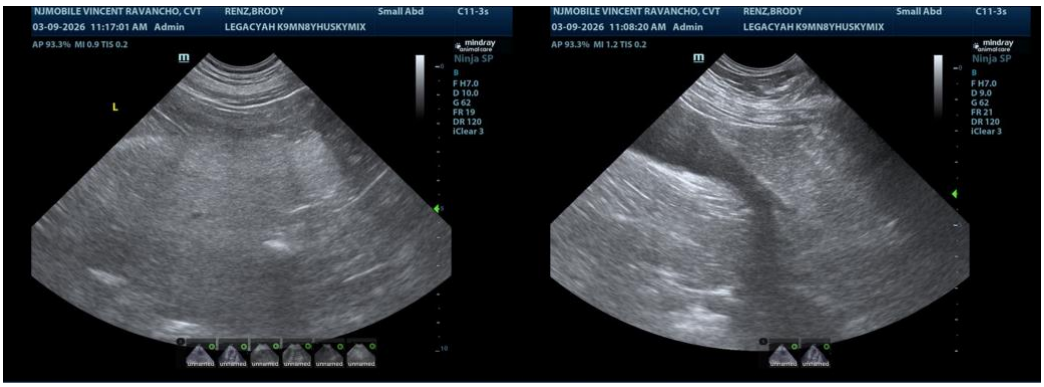

The information and recommendations provided are based on the images presented by the referring veterinarian/sonographer. No evaluation can be communicated regarding pathology that was not visible in the image/video clips provided.

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(CFM), Cert. IVUSS,
CEO, Owner, Founder -- SonoPath.com
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Biomarkers: NT-ProBNP Testing in Clinical Practice

http://www.sonopath.com/Biomarkers

Natriuretic peptides have been widely demonstrated to be useful as markers of the presence and severity of cardiac disease. Brain natriuretic peptide (BNP) is secreted by the heart's ventricles in response to an increase in intracardiac hydrostatic pressure, increased cardiac wall stress, angiotensin II, myocardial hypoxia, and heightened sympathetic tone. BNP is synthesized as a preprohormone precursor and is converted to the prohormone form in the ventricular myocytes. NT-proBNP is formed when its parent prohormone, proBNP, is cleaved into two molecules: NT-proBNP and C-BNP. In circulation, C-BNP rapidly degrades and is therefore difficult to measure in laboratory tests; however, NT-proBNP possesses a much longer half-life and is much easier to detect. Measuring NT-proBNP concentrations using the Cardiopet® proBNP test (IDEXX Laboratories) is recommended in the evaluation of heart failure in dogs and cats.

Several studies evaluating NT-proBNP in the veterinary population have documented its importance. In one study, NT-proBNP concentrations were significantly different for: healthy control dogs and dogs with cardiac disease; dogs with cardiac disease and congestive heart failure (CHF) and dogs with cardiac disease without CHF; and dogs with cardiac disease and cardiomegaly and dogs with cardiac disease without cardiomegaly. NT-proBNP levels have also been shown to offer

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a means of distinguishing between dogs diagnosed with cardiac disease and those diagnosed with respiratory disease but with no evidence of cardiac disease. In dogs with cardiomyopathy, the proBNP test demonstrated adequate sensitivity and specificity to be of diagnostic use.

Indications for use:

The proBNP test can be used to screen dogs with murmurs that are preclinical and as a guide for determining whether additional and more expensive diagnostic tests are required. In one study, NT-proBNP increased in proportion to the grade of murmur and degree of cardiac disease. Using NT-proBNP as a screening mechanism would be especially useful in at-risk breeds, such as Cavalier King Charles Spaniels, Cocker Spaniels, Dobermans, and Boxers.

One should evaluate NT-proBNP levels in puppies with severe murmurs and cases of patent ductus arteriosis (PDA), which can cause cardiomegaly in very young dogs. Elevated levels in a young dog would indicate the need for further testing.

Since auscultation is not very sensitive, assessing NT-proBNP levels may be especially useful for detecting subclinical heart disease in cats. If NT-proBNP is high, then additional imaging, such as radiographs and ultrasound, would be indicated. Reports indicate that NT-proBNP is higher in feline patients with systemic hypertension, severe renal failure, and hyperthyroidism. Therefore, blood pressures, renal parameters, and thyroid levels should be assessed to complete the interpretation of the results. Evaluating NT-proBNP may provide better screening information than standard auscultation, as cats without murmurs can have significant disease. Screening should be pursued in cats with breed predispositions (e.g. Maine Coon), murmurs, and gallops.

In animals with dyspnea, cough, and/or respiratory distress, the test can offer a good means of differentiating between primary cardiac disease and pulmonary disease. Because NT-proBNP testing provides immediate information, it may become increasingly common once the bedside test becomes available.

Range of values:

Dogs:

- 500 pmol/l: Normal. Clinically significant heart disease is not present. If there is dyspnea, it is not due to CHF.
- 500-1100 pmol/l: Elevated. Heart disease may be present. Pursue additional diagnostics, especially if compatible signs are present.
- 1100-1725 pmol/l: Elevated and consistent with heart disease and possibly CHF. Additional workup strongly recommended.
- > 1725 pmol/l: Significantly elevated. CHF is probable and thus likely to be the cause of dyspnea.

Cats:

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- < 45 pmol/l: Normal. Clinically significant heart disease is not present. If there is dyspnea, it is not due to CHF.
- 45-70 pmol/l: Elevated. Heart disease may be present. Pursue additional diagnostics, especially if compatible signs are present.
- 70-180 pmol/l: Elevated and consistent with heart disease and possibly CHF. Additional workup strongly recommended.
- > 180 pmol/l: Significantly elevated. CHF is probable and thus likely to be the cause of dyspnea.

Sample submission to IDEXX Laboratories:

A special submission tube from IDEXX is ideally required for the submission of NT-proBNP samples. Blood is collected in an EDTA tube and then immediately centrifuged. The plasma is then transferred into the IDEXX tube (or, if not available, into another ETDA tube) and subsequently frozen. One must submit the sample to IDEXX in a Styrofoam container using specialized cold packs to keep it cold.

Studies that have evaluated NT-proBNP levels:

One study showed that serum NT-proBNP levels are higher in dogs with cardiac disease than in healthy dogs. The test demonstrated 83% sensitivity and 90% specificity; the cutoff level was > 445 pmol/l. NT-proBNP was significantly higher in dogs with class II and III heart disease compared to those with class I heart disease. It was also significantly higher in dogs with a grade V murmur (median 2233 pmol/l) compared to those with either grade III or IV murmurs (median 1010 pmol/l) or grade I or II murmurs (median 646 pmol/l). Dogs with CHF had an increased level of NT-proBNP (above 1725 pmol/l), whereas those without CHF had levels below 820 pmol/l (88% sensitivity and 76% specificity; PPV 77.5% and NPV of 87%). NT-proBNP levels also correlated positively with cardiomegaly findings on thoracic radiographs, elevated heart and respiratory rates, a left atrial aortic root ratio (LA:Ao ratio) > 1.5, and azotemia.

In another study, dogs with CHF had a much higher NT-proBNP level than dogs with primary respiratory disease (2554 pmol/l vs. 357 pmol/l); however, interestingly, NT-proBNP levels did not correlate with the vertebral heart score or LA:Ao ratio.

In a study with cats, NT-proBNP was significantly elevated in dyspneic cats with cardiac failure compared to cats with primary respiratory disease. The cutoff level was 180 pmol/L and the test demonstrated 94.1% sensitivity and 86.4% specificity. In a study of asymptomatic cats, NT-proBNP levels were used to differentiate between healthy cats and those with occult cardiac disease using a cutoff of 40 pmol/L; the test demonstrated 100% sensitivity and 87.5% specificity.

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