



**PATIENT**

Tucker Ruthruff

**SPECIES**

Canine

**BREED**

Boxer Mix

**SEX**

MN

**AGE**

11y

**WEIGHT**

65 lbs

**INTERPRETED BY**

Maggie Machen  
Lamy, DVM, DACVIM  
(Cardiology)

**IMAGING PERFORMED BY**

Amanda Lacey-Crook, RVT

**HOSPITAL NAME**

River's Edge Pet  
Medical Center

**REFERRING VET**

Dr. Gray

**INVOICE**

29289

**DATE**

2/28/23

**PRESENTING CLINICAL SIGNS**

History: Presented 2/23 for coughing up white foam with increased respiratory rate ; heart murmur but muffled. Started on vetmedin and furosemide after radiographs confirmed cardiomegaly. Presents today for further cardiac work up. Medications started on 2/23: Vetmedin 7.5 mg BID, Furosemide 20mg TID

Abnormal PE/Chem/CBC/UA Results: Labs WNL except slightly elevated ALT See attached ECG for interpretation today

**RADIOGRAPHIC FINDINGS** \*NOTE: Images submitted for supplemental cardiac information only. Cardiomegaly. No obvious evidence of CHF.

**ELECTROCARDIOGRAPHIC FINDINGS**

A six lead ECG is available at 25mm/s; 10mm/mV. The average heart rate is 140bpm (range 107-150bpm). The rhythm is sinus in origin, with a p for every QRS complex and vice versa. The P wave morphology is positive with a normal dimension. Normal PR. The QRS morphology is positive with normal dimension. MEA is normal. A single APCs is identified.No ectopic beats, pauses or dysrhythmias observed.

ECG diagnosis: Normal sinus rhythm with respiratory variation.

**ECHOCARDIOGRAM FINDINGS**

2D, m-mode, color flow and doppler imaging is available. Severe left ventricular dilation with diminished systolic function. Decreased LV wall thickness with increased sphericity. Moderate to severe left atrial enlargement. The mitral valve appears mildly thickened with no obvious prolapse into the left atrial lumen. Moderate eccentric mitral regurgitation secondary to annular stretch. Normal velocity. Mild tricuspid regurgitation. Moderate right atrial and ventricular dilation. TR velocity consistent with mild pulmonary hypertension. The aortic valve is normal in morphology and mobility. No subvalvular ridge present; normal LVOT velocity. No aortic insufficiency. Normal pulmonic valve with trace pulmonic insufficiency seen. No pericardial or pleural effusion noted. Hepatic congestion noted on subcostal views. No obvious cardiac tumors.

**CARDIAC CHART**

CANINE CARDIAC PARAMETERS	MR VMAX	TR VMAX	LA/AO	LA/AO	FS	EF	EPSS
	(m/s)	(m/s)	(Boon method)	(Heart Base; Swe)	(%)	(%)	(cm)
NORMAL PARAMETER	4.5-5.5	<2.7	1.3	<1.6	28-40	40-100	<0.6
PATIENT	5.5	2.9	1.9	1.9	11	18	1.9
CANINE CARDIAC PARAMETERS	HR	AV VMAX	PV MAX	BODY WEIGHT	LA	LVIDd	LVIDs
	(BPM)	(m/s)	(m/s)	(kg)	2D short axis Base view	Avg; 2D and m-mode short axis	Avg; 2D and m-mode short axis
NORMAL PARAMETER	50-100	0.7-1.7	0.7-1.6	BELOW	BELOW	BELOW	BELOW
PATIENT	NM	1.1	1.3		3.9	6.3	5.6
*Normal chamber parameters expressed as a mean value (SD)				3	1.27 (5.3)	2.46 (2.46)	1.36 (5.5)
<b>BODY WEIGHT DEPENDENT PARAMETERS</b>				5	1.40 (4.5)	2.74 (5.2)	1.60 (4.7)
				10	1.50 (3.8)	3.27 (3.5)	2.06 (3.1)
				15	1.83 (2.0)	3.71 (2.4)	2.43 (2.1)
				20	2.02 (1.9)	4.14 (2.2)	2.80 (2.0)



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*\*Note: All measurements based upon multi-modal images and methods. An average value is reported.*

Adapted from June Boon, Veterinary Echocardiography, 1998  
Rishniw M and Hollis NE, J Vet Intern Med 2000; 14:429-435  
Hansson et al, Vet Rad and Ultrasound 2002  
Bonagura et al. Echocardiography: principles of interpretation, Vet

25	2.18 (2.4)	4.48 (2.9)	3.10 (2.5)
30	2.33 (3.3)	4.83 (3.9)	3.39 (3.4)
35	2.48 (4.3)	5.17 (5.0)	3.69 (4.5)
40	2.62 (5.2)	5.48 (6.1)	3.96 (5.4)
50	2.88 (7.1)	6.07 (8.3)	4.46 (7.4)

## INTERPRETATION OF THE FINDINGS & FURTHER RECOMMENDATIONS

Unfortunately, this patient has significant cardiomyopathy and systolic dysfunction. This is causing dilation and volume overload of both the left and right heart resulting in insufficiency of the mitral and tricuspid valves. The quantity of MR is significant, and a concurrent valve issue cannot be ruled out. Regardless, the severity of dysfunction and pump failure is severe, and the patient is at high risk for decompensating into congestive failure. Patient will always be at risk for right and/or left-sided CHF, development of arrhythmias/syncope and/or sudden death going forward. Hepatic congestion is noted, which is consistent with early CHF.

Systolic failure can be primary in nature (DCM) or secondary to taurine deficiency, myocarditis, hypothyroidism, tachycardia-induced cardiomyopathy, or infiltrative disease such as lymphoma. While primary disease is certainly possible in a senior Boxer mix, consider testing for primary causes that may be treatable. A troponin (cTnI) level can be submitted to further investigate infiltrative/inflammatory contribution (myocarditis). Additionally, a taurine level may be helpful (screen for malabsorption issue), and a thorough diet history given the recent correlation with grain free/boutique brand/exotic ingredient diets. Finally, further systemic evaluation for underlying infiltrative contribution such as neoplasia is also reasonable (abdominal ultrasound, etc.).

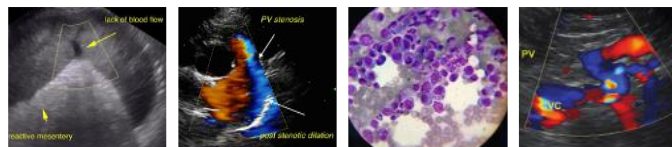
Regardless of cause, prognosis is guarded to poor at this stage in the disease process, with an average survival time of <6 months. The only treatable cause of systolic failure is diet/taurine deficiency, which is uncommon on commercially formulated dog foods. If the diet is of concern, highly recommend immediate diet change and taurine supplement regardless of blood taurine results. Please see the FDA website for more information.

The ECG is largely normal, with a single APC. This is not surprising in this patient in crisis and does not warrant therapy. That being said, there is high risk for development of rapid atrial fibrillation in the future. Monitor for acute collapse or lethargy and reassess.

Immediate institution of full cardiac supportive medications is recommended as below due to high risk for decompensation. This includes low dose therapy. Cases of systolic failure are at high risk for malignant tachyarrhythmias (such as VT or rapid AF) and sudden death, and this should be expressed to the owner. Activity restriction is advised.

Elective anesthesia is not advised due to high risk for complications.

Omega fatty acid supplementation and mild salt restriction may be of some long-term benefit. Monitor for development of a cough, worsening labored breathing, abdominal distention, exercise intolerance or collapse episodes in the future. Monitoring of sleeping breathing rates at home is recommended to assess response to medications and recurrence of CHF in the future.



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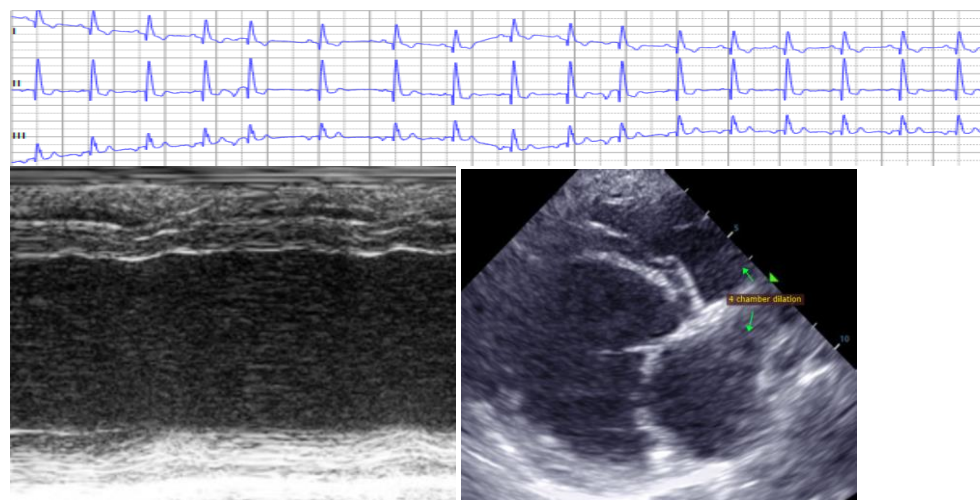
**PLAN:**

Baseline BP recommended. Initiate aldosterone antagonist Spironolactone 1-2mg/kg PO q12h. Institute furosemide 1-2mg/kg PO q12h. Institute Pimobendan 0.3mg/kg PO q12h. Institute taurine 1000mg PO q12h. Diet history/change, etc as discussed.

Monitor a renal panel and blood pressure in 1-2 weeks to ensure tolerance. If BP >130mmHg, institute ACEI 0.5mg/kg PO q12h. Consider cTnI, taurine level, AUS as discussed above.

A recheck echocardiogram is recommended in 4-6 months to screen for progression, sooner if clinical issues arise in the interim.

**IMAGES**



The information and recommendations provided are based on the images presented by the referring veterinarian. 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.

**Maggie Machen Lamy, DVM**  
Diplomate of the American College of Veterinary Internal Medicine (Cardiology)  
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