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Clinical Sonography & Telecytology
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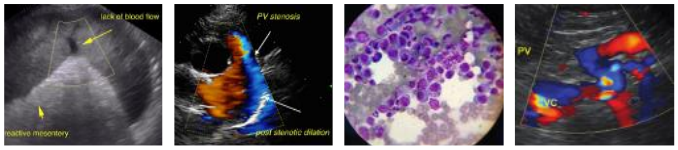


PATIENT
Sugar Dale

SPECIES
Canine

BREED
Chihuahua

SEX
Male Neutered

AGE
13 years

WEIGHT
12.3lbs

INTERPRETED BY
Maggie Machen Lamy, DVM, DACVIM (Cardiology)

IMAGING PERFORMED BY
Dana Alterman, RDCS, LVT

HOSPITAL NAME
Eubank Animal Clinic

REFERRING VET
Dr. Garb

INVOICE
28624

DATE
1/30/23

PRESENTING CLINICAL SIGNS

History: Multiple syncopal episodes - lasting 2 minutes. Not eating well and lethargic. Grade 3/6 systolic murmur. BP -80-90mmHg. Asculs raspy with subtle crackles over right thorax. HW negative. -Abnormal PE/Chem/CBC/UA Results: Mild neutrophilia with marked elevation of ALP and mild elevation of ALT.

ELECTROCARDIOGRAPHIC FINDINGS *Note: Single lead ECGs are evaluated as a rhythm strip. Morphology/MEA cannot be definitively commented on.

A single lead ECG is available; 50mm/s, 20mm/mV. The average heart rate is 100bpm (range 66-130bpm). The underlying rhythm appears sinus in origin, with a p for every QRS complex. The QRS is inverted. Occasional sinus pauses without obvious atrial activity and an escape beat firing. No obvious AV block; however, this is not ruled out with a single-lead tracing.
ECG diagnosis: Profound sinus bradycardia with occasional sinus arrest suspected and escape foci firing. AV block is not ruled out.

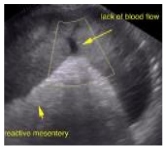
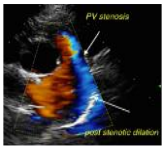
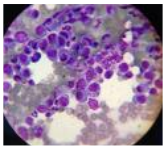
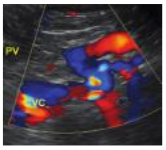
ECHOCARDIOGRAM FINDINGS

2D, m-mode, color flow and doppler imaging is available. The mitral valve is mildly thickened with minimal prolapse into the left atrial lumen. There is trace mitral regurgitation present. Normal velocity, There is mild left atrial enlargement. There is no left ventricular dilation. Left ventricular systolic function is adequate. Septal flattening in systole with an obvious bounce. There is normal systolic flow velocity across the aortic valve, no insufficiency. The aortic valve appears normal. Moderate to severe right atrial enlargement. Moderate right ventricular enlargement with hypertrophy. The tricuspid valve is mildly thickened with moderate to severe tricuspid regurgitation. Velocity consistent with severe pulmonary hypertension. The pulmonary artery is mildly dilated. No PI. Normal outflow velocity. No pericardial/pleural effusion or cardiac masses are seen.

CARDIAC CHART

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	<1.6	28-40	40-100	<0.6
PATIENT		5.0	NM	1.4	42	75	0.2
CANINE CARDIAC PARAMETERS	**HR** (BPM)	**AV VMAX** (m/s)	**PV MAX** (m/s)	**BODY WEIGHT** (kg)	**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	BELOW	BELOW	BELOW	BELOW
PATIENT	NM	0.9	0.8	5.6	1.9	2.1	1.2
*Normal chamber parameters expressed as a mean value (SD)				3	1.27 (5.3)	2.46 (2.46)	1.36 (5.5)
BODY WEIGHT DEPENDENT PARAMETERS				5	1.40 (4.5)	2.74 (5.2)	1.60 (4.7)
Note: All measurements based upon multi-modal images and methods. An average value is reported.				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)
				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)

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

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Bonagura et al. Echocardiography: principles of interpretation, Vet Clin North Am 15:1177, 1995	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

Chronic degenerative valve disease causing trace mitral and moderate to severe tricuspid regurgitation. Mild left atrial enlargement indicates the risk for left-sided spontaneous congestive heart failure is low. Severe pulmonary hypertension is also identified, which is more clinically relevant. There is significant right heart enlargement secondary to elevated RV filling pressures. No additional issues such as systolic dysfunction are identified.

The underlying genesis of PAH is poorly understood in cases other than heartworm infestation (this patient was negative), though it occurs with increased frequency in a variety of forms of chronic lung disease and in patients with idiopathic pulmonary fibrosis. Clinical signs of weakness, heavy breathing, cyanosis, and syncope are attributed to severe PAH.

Syncope in this patient is most likely cardiogenic in origin, secondary to pulmonary hypertension. Sildenafil and Pimobendan are recommended given the presentation and echo findings, in hopes of lowering pulmonary pressures and improving clinical signs. The ECG does show a profound sinus bradycardia with sinus pauses and escape foci, which may or may not be related. While escape beats are a normal response to a slow heart rate, the underlying cause of bradycardia should be considered. My assumption in this case is primary pulmonary disease is present (based upon crackles on exam) which has led to both pulmonary hypertension and significantly elevated vagal tone (ie bradycardia). That being said, a sinus node disorder could also lead to collapse episodes and an **Atropine challenge is strongly recommended.** Depending on response, theophylline may be beneficial in this case for both heart rate stimulation and bronchodilation and should be considered. If the episodes persists despite these recommendations, a holter monitor should be considered.

Cough suppression may be indicated to help control disease. If the reported cough has increased, a course of Baytril may be helpful to cover any infectious exacerbant.

Prognosis is guarded long term, with risk for progression to right-sided CHF, development of exertional dyspnea/collapse, and/or debilitating cyanosis.
Anesthesia is not recommended at this time.

Omega fatty acid supplementation and mild salt restriction may also be of some long-term benefit. Monitor for development of a progressive cough, labored breathing, exercise intolerance or collapse episodes.

PLAN:

Consider an atropine challenge (give 0.04mg/kg IV or IM) and assess response. If response is lackluster, a holter monitor and/or referral should be considered. If response is normal, high vagal tone is diagnosed and Theophylline is recommended. Institute Sildenafil to 1-2mg/kg PO q8h. Institute Pimobendan 0.3mg/kg PO q12h. Reassess status in 1-2 weeks and reassess response to medications. If patient remains symptomatic, reevaluation is recommended.

Recommend recheck echocardiogram in 6 months to screen for progression, sooner if any development of clinical signs arise.

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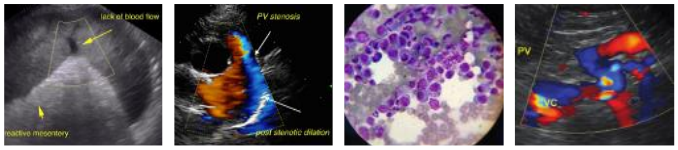

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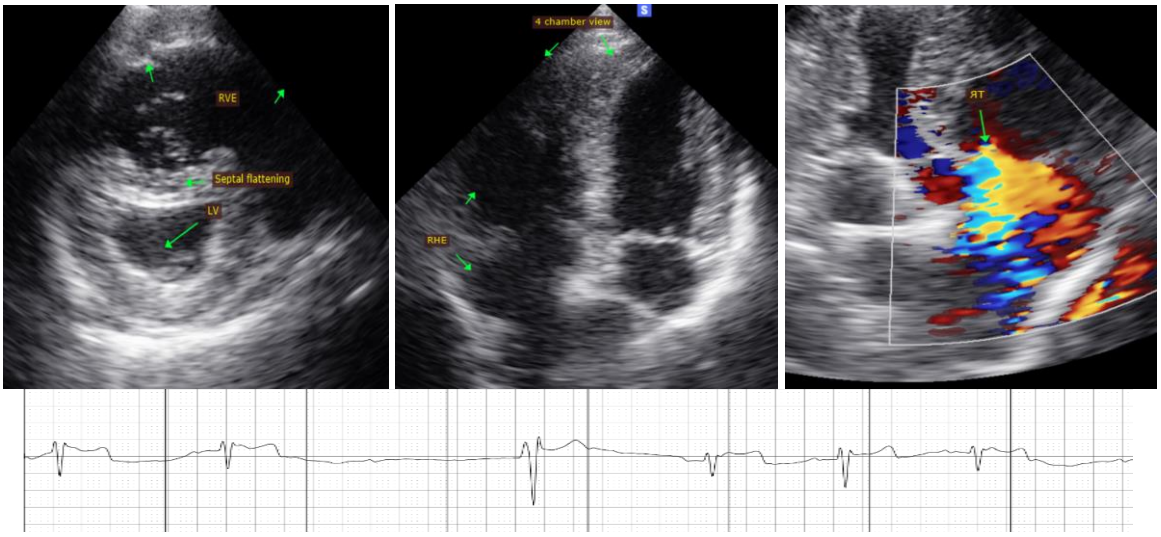
IMAGES



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. This report was generated using transcription software, and minor dictation errors may be present. 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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