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Clinical Sonography & Telecytology
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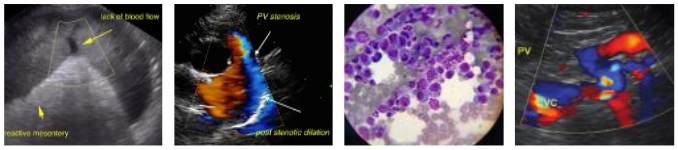

SonoPath.com
1-800-838-4268 info@sonopath.com

PATIENT
Daisy Brook

SPECIES
Canine

BREED
Shih Tzu

SEX
Female Spayed

AGE
16 years

WEIGHT
12.8lbs

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

IMAGING PERFORMED BY
Kelly Romero, DVM

HOSPITAL NAME
FC Veterinary Emergency Hospital

REFERRING VET
Dr. Romero

INVOICE
22480

DATE
2.9/22

PRESENTING CLINICAL SIGNS

History: History of cough that worsened about last Friday. Presented to a different ER on Saturday in respiratory distress. Crackles present and a Grade IV/VI systolic murmur auscultated (historically has had a low-grade II murmur). Was placed in oxygen, given furosemide. Ultimately sent home on sildenafil 10 mg BID and Clavamox and has been doing much better. Eating. No respiratory distress Spends part of year in TX, other in Colorado on front range where elevation 5,000 ft.
Abnormal PE/Chem/CBC/UA Results: PE: Not hearing a murmur today. Crackles appreciated ventral right thorax, mild. Blood pressure today 162 systolic. Arrhythmia appreciated during echo with long pauses. Pet very anxious - had to give butorphanol for echo - mild improvement. No fever. Blood work on Saturday - BUN 55, heartworm test negative, normal WBC Radiographs from Saturday with radiology review 1. Mixed diffuse bronchointerstitial and right cranioventral alveolar lung patterns 2. Suspected bronchiectasis in the right cranial lung lobe 3. Possible main pulmonary artery enlargement 4. Suspected substantial secondary aerophagia The heart was normal sized w/ VHS 9 Comments: The respiratory signs are likely associated with the cause of the lung pattern however the pulmonary changes may have multifactorial cause. The right cranioventral alveolar pattern with bronchiectasis in the right cranial lung lobe is concerning for pneumonia that may have some degree of chronicity or recurrence to result in bronchiectasis. The more diffuse lung pattern could be associated with chronic lung disease such as pulmonary fibrosis, pulmonary hypertension, possibly bronchopneumonia.

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 from an anesthesia monitor; 50mm/s, 10mm/mV. The recorded average heart rate is 122bpm; however, mm marks cannot be visualized to verify. Appears appropriate with presumably respiratory variation. Overall bradycardia. P for every QRS complex and vice versa. The P and QRS morphologies are positive. No ectopic beats, pauses or dysrhythmias observed.
ECG diagnosis: Respiratory sinus arrythmia.

ECHOCARDIOGRAM FINDINGS

2D, m-mode, color flow and doppler imaging is available. Mild thickening of mitral valve leaflets with no obvious prolapse into the left atrial lumen. No mitral regurgitation with a normal left atrial dimension. Normal LV diameter with adequate myocardial function. Subtle septal flattening in systole. The tricuspid valve appears markedly thickened with trace/mild tricuspid regurgitation. Mild right atrial enlargement; significant right ventricular dilation and hypertrophy consistent with severe pulmonary arterial hypertension. TR velocity is suspected to be an underestimation. Pulmonic and aortic valves are normal in morphology and mobility. Mild main PA and branch dilation. No obvious pulmonic insufficiency. Normal pulmonic and aortic outflow velocities. No pericardial or pleural effusion. No cardiac tumors observed.

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	NA	3.4	NM	1.3	33	65	NM

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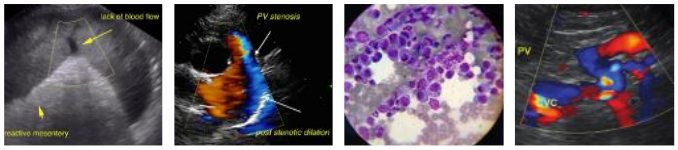

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CANINE CARDIAC PARAMETERS	HR (BPM)	AV VMAX (m/s)	PV MAX (m/s)	BODY WEIGHT (kg)	LA 2D short axis Base view (cm)	LVIDd Avg; 2D and m-mode short axis (cm)	LVIDs Avg; 2D and m-mode short axis (cm)
NORMAL PARAMETER	50-100	0.7-1.7	0.7-1.6	BELOW	BELOW	BELOW	BELOW
PATIENT	NM	1.2	0.8	5.8	1.7	1.8	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)
Adapted from June Boon, Veterinary Echocardiography, 1998				25	2.18 (2.4)	4.48 (2.9)	3.10 (2.5)
Rishniw M and Hollis NE, J Vet Intern Med 2000; 14:429-435				30	2.33 (3.3)	4.83 (3.9)	3.39 (3.4)
Hansson et al, Vet Rad and Ultrasound 2002				35	2.48 (4.3)	5.17 (5.0)	3.69 (4.5)
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)

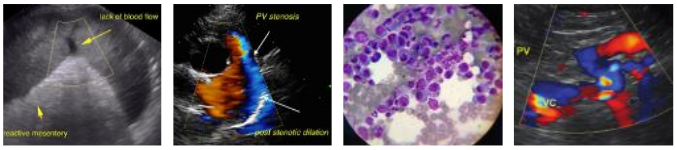
INTERPRETATION OF THE FINDINGS & FURTHER RECOMMENDATIONS

Significant pulmonary hypertension (PAH) is present, as evidenced by right heart enlargement. The estimated systolic pulmonary arterial pressure is 60-80mmHg, with normal being <25mmHg. This is causing hypertrophy and dilation of the right ventricle (indicating right-heart pressure overload). The left heart dimensions are normal. No additional issues are identified.

Clinical signs of weakness, heavy breathing, cyanosis, and syncope are attributed to severe PAH. The underlying genesis of PAH is poorly understood in cases other than heartworm infestation, though it occurs with increased frequency in a variety of forms of chronic lung disease and in patients with idiopathic pulmonary fibrosis. If not performed, a heartworm antigen test is recommended. Given the chronicity of the disease seen here, in addition to the radiographic report, underlying airways issues is suspected as an underlying cause with an acute secondary exacerbating insult (infectious or inflammatory). Patients with this degree of PAH and pulmonary disease can develop right-sided congestive heart failure (ascites), debilitating cyanosis, labored breathing and exertional syncope if poorly controlled.

Given the recent history of respiratory signs and collapse, the most common cause is an infectious or inflammatory insult causing a decline in already poor oxygenation status. A PTE cannot be ruled out. Coverage with broad spectrum pulmonary antibiotic (fluoroquinolone) is typically recommended; however, **the patient responded well to Clavamox and no additional therapy is necessary.** Continue Sildenafil lifelong as below, in addition to use of Pimobendan. Diuretics are contraindicated prior to congestive heart failure as they can further reduce pre-load in cases of debilitating PAH and worsen clinical signs. Given that the patient has stabilized, no additional medications are clearly warranted at this time. Use of theophylline and/or taper course of anti-inflammatory steroids can also be beneficial in these cases, if clinical signs persist or to treat exertional dyspnea or acute flare ups. The goal is to decrease the inflammatory component as much as possible. PRN use of cough suppressants may also be beneficial. Unfortunately, the prognosis overall is poor, however I am hopeful we can provide some medical relief going forward.

The brief ECG shows an overall bradycardia with presumably respiratory variation. Primary respiratory disease is a common cause of profound sinus arrythmia, which is suspected here. If



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the heart rate does not stimulate with activity or stress, consider an Atropine Challenge to ensure a normal response. Underlying sinus node disease is also a possibility; however, this is considered less likely. No treatment is indicated based upon what is seen here in a dog without associated clinical signs, such as collapse.

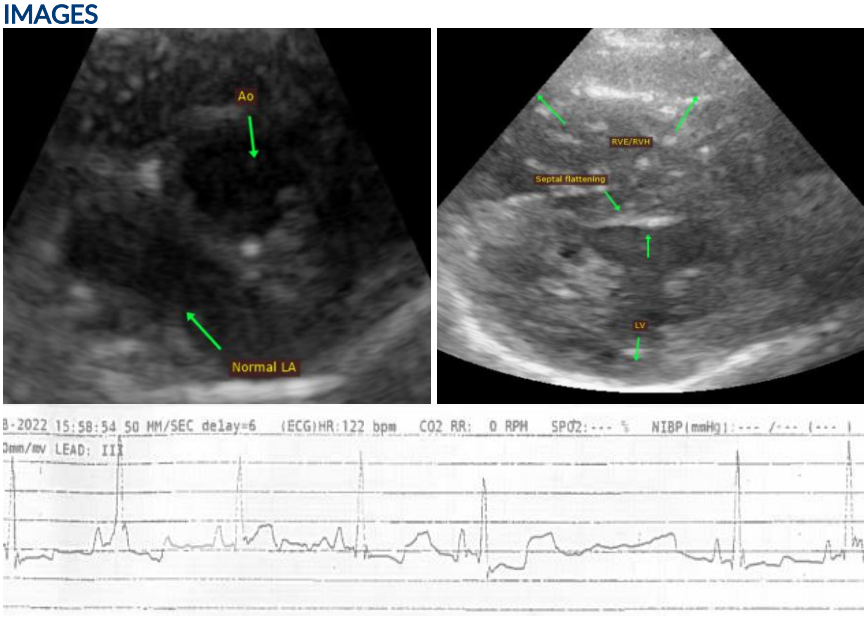
Omega fatty acid supplementation (anti-inflammatory) may be of some long-term benefit. Monitor for worsening of labored breathing, exercise intolerance or collapse episodes.

PLAN

Given that the patient is doing well, continue Sildenafil as prescribed. Institute Pimobendan 0.25-0.3mg/kg PO q12h. If any residual respiratory signs are noted, a course of Baytril, anti-inflammatory steroids, theophylline, etc. can be utilized. Can also use Hydrocodone for quality of life. Consider further evaluation of the arrythmia as discussed, including an exercise response and/or an Atropine Challenge if indicated. Monitor for syncopal episodes in the future.

Recommend recheck echocardiogram in 6 months to reassess pulmonary pressures, sooner if any development of clinical signs.

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
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