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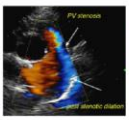
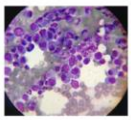
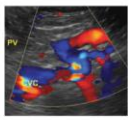

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PATIENT

Barlow K9 Kindness

SPECIES

Canine

BREED

Terrier Mix

SEX

Male Neutered

AGE

3 years

WEIGHT

31lbs

INTERPRETED BY

Maggie Machen Lamy, DVM, DACVIM (Cardiology)

IMAGING PERFORMED BY

Sarah Pender, CVT

HOSPITAL NAME

SVS Imaging QC

REFERRING VET

Dr. Van Noy

INVOICE

25225

DATE

7/8/22

PRESENTING CLINICAL SIGNS

History: Heartworm positive. Coughing. Lethargic.
-Current medications: Prednisone, Gabapentin, Advantage Multi, finishing up a course of Enro.
-Radiograph report: Concern for mild right-heart changes, pulmonary inflammation and possible PAH.

ECHOCARDIOGRAM FINDINGS

2D, m-mode, color flow and doppler imaging is available. Mild diffuse thickening of mitral valve with no prolapse into the left atrial lumen. Trace mitral regurgitation, normal left atrial dimension. Normal LV diameter with adequate myocardial function. The TV appears normal with mild TR. Normal velocity. No significant right atrial or ventricular dilation. Mild RV hypertrophy. The MPA and branches are mildly dilated. Suspect worm(s) in the right branch. The pulmonic and aortic valves are normal in morphology and mobility. Normal pulmonic and aortic outflow velocities with laminar flow. No aortic and trace pulmonic insufficiency. No pericardial or pleural effusion noted.

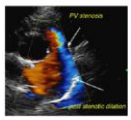
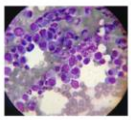
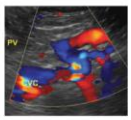
CARDIAC CHART

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	NM	2.5	1.5	1.4	37	69	0.3
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	93	1.2	0.7	14.1	2.3	3.1	1.9
*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)
				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)

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 Clin North Am 15:1177, 1995

INTERPRETATION OF THE FINDINGS & FURTHER RECOMMENDATIONS

Suspicion for an adult heartworm infestation in the right branch of the pulmonary artery. The MPA and branches are mildly dilated which supports the suspicion of early pulmonary hypertension secondary to the infestation, even without TR velocity elevation. It is important to note that even with good visualization ultrasound is not entirely sensitive (i.e., adult worms may easily be missed either peripherally or elsewhere). What is unusual is the RA/RV are not significantly enlarged, which may suggest a relatively acute onset of PAH. This is certainly a concern going forward in a 3-year-old dog, and reassessing in the future is recommended to determine progression/persistence. Even if we are able to safely clear the infestation, these

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cardiac changes may be irreversible, and the prognosis is guarded long term. The left heart is relatively normal, with a hemodynamically insignificant mitral leak.

Heartworms can cause significant damage to the lung tissue leading to pulmonary damage, pulmonary hypertension and clinical signs such as coughing, decreased ability to exercise, or difficulty breathing. Disease severity can range from an asymptomatic dog with few worms to dogs with severe respiratory signs. In the most severe cases, caval syndrome may develop due to a very high worm burden sheering blood cells as they pass through the heart. Caval syndrome is a life-threatening emergency that requires immediate surgical removal of the worms.

Sildenafil, Pimobendan and treatment for the cough (hydrocodone, Doxycycline) is recommended. If extraction would be a possibility from a financial standpoint, I would consider referral to a local cardiologist for advanced echocardiography and evaluation. If that is not a possibility, utilizing the standard approach to heartworm treatment as dictated by the American Heartworm Society is recommended, including 30 days of doxycycline and heartguard prior to the split Immiticide protocol. **Please see website and protocol for specific information.** There is high risk for thromboembolism in any patient, however those with adult worms in the PA are no question at elevated risk. At this time, exercise restriction is paramount, including cage rest with leash walks only, as a worm embolus can be a life-threatening complication of the disease. This should be continued for an additional 6-8 weeks following therapy.

Modifications to this protocol are sometimes elected depending on individual circumstances which may involve fewer injections or a “slow kill” method. These are not, however, our standard recommendation as alternate treatment may not result in effective treatment of the infestation. Following treatment, retest for heartworm disease 6 months after completing the full course of therapy. Anesthesia is NOT advised prior to completing the protocol, as vasodilation can lead to increased risk for an embolus. Prognosis is guarded, as the right heart/MPA changes are often permanent and may cause clinical signs (exertional syncope/dyspnea, right-sided CHF) in the future.

During therapy, there is high risk for a worm embolus and breathing rate and effort should be monitored closely. Anti-inflammatory prednisone can be used if becomes symptomatic. Patient will be at high risk for developing clinical signs due to pulmonary hypertension with age given the inherent secondary inflammation and damage to the pulmonary vasculature and lungs, and periodic rechecks may be helpful. Monitor for exertional dyspnea or fainting episodes going forward.

PLAN

Institute Pimobendan 0.3mg/kg PO q12h. Institute Sildenafil 1-2mg/kg PO q8h. Continue pulmonary antibiotic therapy and anti-inflammatory steroids as indicated. Consider referral as discussed.

Once heartworm negative, a recheck echocardiogram and chest radiographs are recommended in 6 months to reassess right heart changes.

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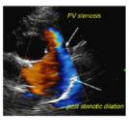
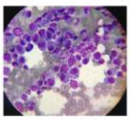
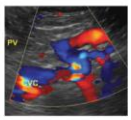

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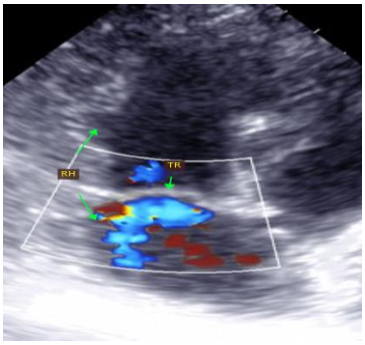

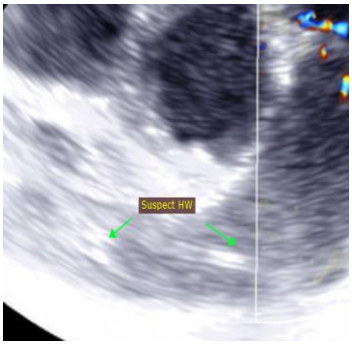

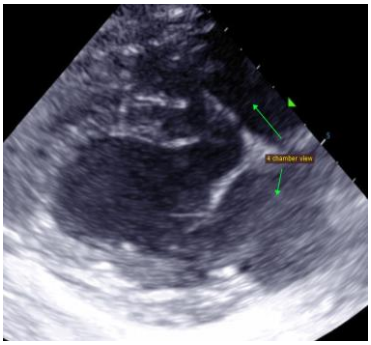

The information and recommendations provided are based on the images presented by the referring veterinarian. No evaluation can be communicated regarding pathology that was not visible in the image/video clips provided.

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)
info@sonopath.com