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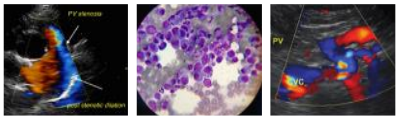

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PATIENT
Karai Marrero

SPECIES
Canine

BREED
Pit Mix

SEX
Female Spayed

AGE
2019

WEIGHT
48lbs

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

HOSPITAL NAME
Perry Hall Animal Hospital

REFERRING VET
Dr. Miller

INVOICE
22853

DATE
3.1.22

PRESENTING CLINICAL SIGNS

History: Patient presents for evaluation- owner reports "bloated abdomen". No murmur noted on PE, but patient was coughing throughout PE. Chest and abdominal rads were recommended. Patient gets a home-made diet- client is unsure of whether or not this is grain free but does not work with a board-certified veterinary nutritionist.
-Pertinent abnormal PE/Chem/CBC/UA Results: **4dx heartworm positive.**
-Radiographs Abdomen: Poor serosal detail.
-Radiographs Chest: Rounding of cardiac silhouette, concern for main pulmonary arterial distention. Patchy diffuse mixed pulmonary bronchial and interstitial pattern. Right sided pleural fissure lines.
-Blood pressure: 120mmHg.
-Sedation used: Gabapentin and Trazodone PO.
-Pertinent previous ultrasound results: No previous.
-STAT: Requested.
-Imaging performed by: Stephanie Pearce RDCS, RVT.

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. No mitral regurgitation, normal left atrial dimension. small LV diameter with adequate function. The TV appears mildly thickened with severe tricuspid regurgitation. Velocity consistent with severe pulmonary hypertension. Severe right atrial and ventricular dilation with evidence of hypertrophy. Septal flattening in systole. The MPA and branches are severely dilated. The pulmonic and aortic valves are normal in morphology and mobility. Normal pulmonic and aortic outflow velocities with laminar flow. Concern for adult works seen in the distal right pulmonary artery. Mild pulmonic insufficiency. No aortic 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	NA	4.5	NM	1.1	45	78	NM
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	100	1.4	0.9	21.8	2.1	3.0	1.7
*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, leading to severe dilation of the right heart and pulmonary artery. The visualization is highly suspicious with worms likely present in the pulmonary artery. 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). Regardless, there is evidence of significant pulmonary hypertension in this study as well (TR velocity thought to be an under-estimation), as evidenced by secondary RA/RV changes and development of TR. This is certainly a concern going forward and reassessing in the future is recommended to determine progression. Even if we are able to safely clear the infestation, these cardiac changes may be irreversible, and the prognosis is guarded to poor long term.

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.

Unfortunately, the degree of right-sided damage has led to congestive heart failure as evidenced by large volume ascites. A therapeutic abdominocentesis is recommended to improve comfort. Additionally, immediate medical stabilization is recommended including diuretics, Sildenafil, Pimobendan and treatment for the cough (hydrocodone, Doxycycline). If extraction would be a possibility from a financial standpoint, I would **consider immediate 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 heart guard prior to continuing 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. It must be reiterated that this patient is considered end-stage, and our goals are to improve QOL for the short term. If QOL suffers, humane euthanasia should be considered.

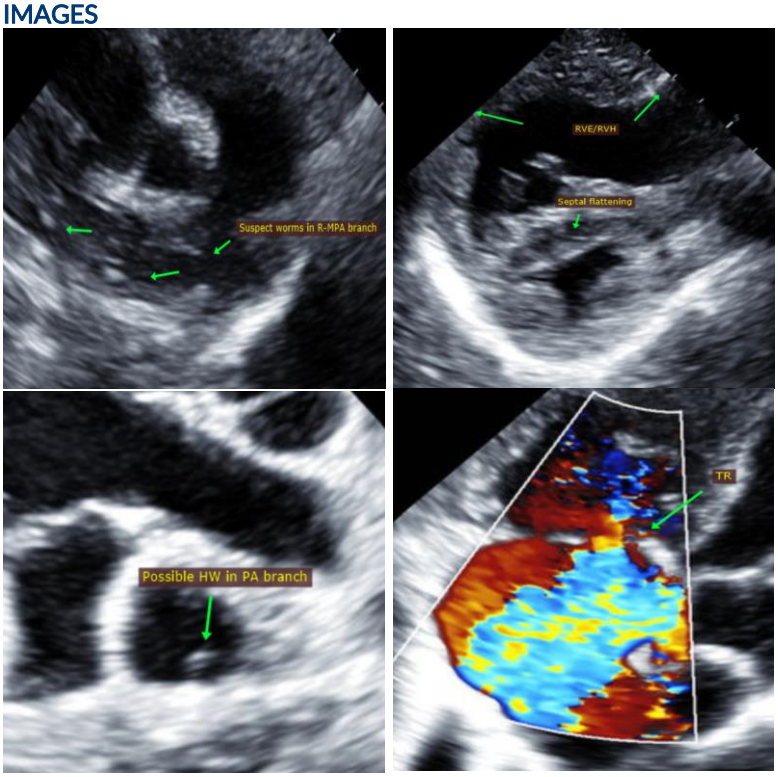
During therapy, there is high risk for a worm embolus and breathing rate and effort should be monitored closely. Anti-inflammatory prednisone can be used if becomes symptomatic. Patient will be at high risk for developing clinical signs due to pulmonary hypertension with age given the inherent secondary 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

Abdominocentesis if needed, immediate referral as discussed. Institute Lasix 1-2mg/kg PO q12h. Institute Spironolactone 1-2mg/kg PO q12h. Institute Pimobendan 0.3mg/kg PO q12h. Institute Sildenafil 1-2mg/kg PO q8h. Institute Doxycycline/Heartguard as dictated by the HW society. If patient’s ascites persists/worsens, a course of anti-inflammatory prednisone is recommended.

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

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.

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