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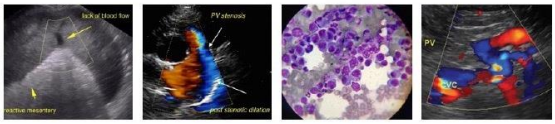

THE FOCAL ZONE
IMAGING PERFORMED BY
289-808-2608 info@thefocalzone.com

**PATIENT**
Lincoln Mastrolia

**SPECIES**
Canine

**BREED**
Yorkshire Terrier

**SEX**
Male Neutered

**AGE**
14 years

**WEIGHT**
2.14kgs

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

**IMAGING PERFORMED BY**
Crystal Hill

**HOSPITAL NAME**
Hamilton Regional

**REFERRING VET**
Dr. Grewal

**INVOICE**
28370

**DATE**
1/17/23

## PRESENTING CLINICAL SIGNS

History: Patient presented 1/17/23 for rapid, shallow breathing. Has history of collapsed trachea and prev bronchial pneumonia in April 2022. Historically was diagnosed with grade 3/6 heart murmur. Today the murmur is a 5/6. Patient not eating. PE - serous nasal discharge from right nostril, tachypnea with abdominal effort, unable to auscultate ventral thorax, increased bronchial sounds. Was given two doses of Furosemide, Butorphanol and Midazolam and now seems more comfortable.
Abnormal PE/Chem/CBC/UA Results: CBC mod leukocytosis, moderate neutrophilia with susp bands, moderate eosinophilia, mild elevation MPV M1 elevation BUN, mild hypernatremia snap cPL normal. Rad report: Subjectively left sided cardiomegaly, normal VHS, mild pulmonary venous distension, moderate patchy interstitial pulmonary pattern. No pleural effusion. Severe variation in tracheal diameter. Small amount of fluid within the caudal thoracic esophagus.

## 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. Small LV diameter with adequate myocardial function. Septal flattening. The tricuspid valve appears mildly thickened with mild tricuspid regurgitation. Moderate right atrial enlargement; moderate right ventricular dilation and hypertrophy consistent with pulmonary arterial hypertension. TR velocity consistent with moderate to severe PAH. The pulmonic and aortic valves are normal in morphology and mobility. Moderate main PA and branch dilation. Trace 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 | 4.3 | NM | 1.24 | 61 | 94 | 0.25 |
| **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 | 142 | 0.5 | 0.6 | | 1.0 | 1.3 | 0.5 |
| *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

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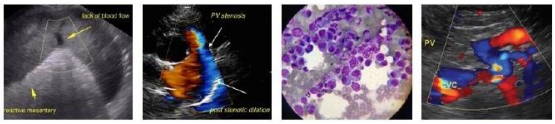

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## INTERPRETATION OF THE FINDINGS & FURTHER RECOMMENDATIONS

Severe pulmonary hypertension (PAH) is present, as evidenced by an elevated TR velocity and right heart/MPA enlargement. The estimated systolic pulmonary arterial pressure is >80mmHg, with normal being <25mmHg. This is causing hypertrophy and dilation of the right heart and MPA (indicating right-heart pressure overload). The left heart dimensions are normal without significant pathology. No tumors or effusions are appreciated.

Clinical signs of weakness, heavy breathing, cyanosis, and syncope are attributed to 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 a chronic cough history, COPD/chronic bronchitis and/or upper airway disease as an underlying cause with an acute secondary exacerbating insult (infectious or inflammatory) is suspected. Patients with this degree of PAH and pulmonary disease can develop right-sided congestive heart failure (ascites/pleural effusion), debilitating cyanosis, labored breathing and exertional syncope if poorly controlled.

Given the recent history of respiratory signs, 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 recommended, in addition to aggressive vasodilation using pimobendan and sildenafil. I would not utilize a diuretic, as **decreasing blood volume can further decrease preload and worsen clinical signs**. There may be risk for right-sided CHF in the future; however, no effusions are noted making this unlikely. If the patient experiences any additional respiratory compromise, continued hospitalization for oxygen support and IV antibiotics may be necessary.

Once stable, use of theophylline and/or taper course of anti-inflammatory steroids can also be beneficial in these cases, to treat exertional dyspnea or acute flare ups and 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.

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

DC Lasix. Institute Pimobendan 0.3mg/kg PO q12h. Institute sildenafil (Viagra) 1-2mg/kg PO q8h. Consider course of Baytril and oxygen support. Can also use more aggressive hydrocodone and/or theophylline depending on chronic clinical signs of cough/exertional dyspnea.

Recommend recheck echocardiogram in 6 months to reassess pulmonary pressures, sooner if any recurrent clinical signs in the interim.

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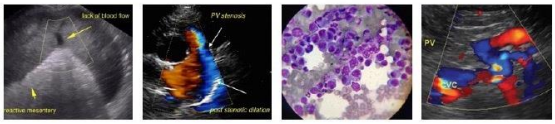

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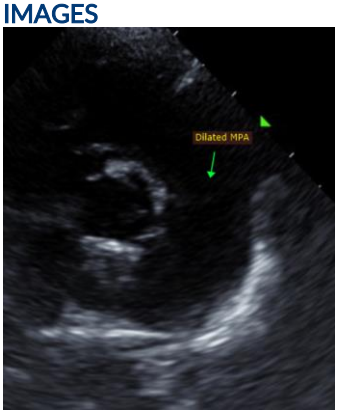
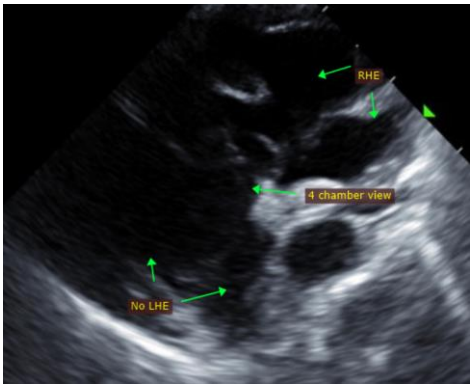
## IMAGES




**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. 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