



**PATIENT**

Zippy Mercier

**SPECIES**

Canine

**BREED**

West Highland Terrier

**SEX**

Male Neutered

**AGE**

14 years

**WEIGHT**

21.5lbs

**INTERPRETED BY**

Maggie Machen  
Lamy, DVM  
DACVIM (Cardiology)

**IMAGING PERFORMED BY**

Pamela Harrigan,  
RDCS

**HOSPITAL NAME**

Mass Veterinary  
Services

**REFERRING VET**

Dr. Masloski

**INVOICE**

29143

**DATE**

2/21/23

**PRESENTING CLINICAL SIGNS**

History: Recheck echo. History chronic valvular disease - Stage B2. History persistent crackles. (Had been thought to be related to CHF; Lasix was started; however, reassessment dismissed this diagnosis and Lasix was discontinued). Presently, Zippy has been having respiratory issues for some time with inspiratory crackles noted for several months. He is suspected of having pulmonary fibrosis and was started on oral prednisone and is transitioning to inhaled steroids. A recheck of his respirations on the 8th revealed a low blood pressure 90-100 which prompted a decrease in his enalapril. His heart rate at that time was in the 60's. A recheck of his blood pressure on the 16th revealed it to be normal with a range of 120-140. His heart rate remained low at 60-80 with collapse episodes noted. Pauses were noted on auscultation. Theophylline was added. On exam: NSR, grade III/VI murmur with PMI left apical area, PSS, inspiratory crackles noted throughout lung fields---dorsal > ventral; left>> right with some areas of quiet lung fields on right; abdominal effort to respirations; no cough with tracheal palpation, mm pink, moist, CRT<2. BP: 218-220mmHg. Current medications: 1) Pimobendan/vetmedin 2.5mg 1 tab twice a day 2) Enalapril 2.5mg 1.5 tabs daily 3) Sildenafil 20mg 1/4 tab twice a day 4) Prednisone 20mg 1/4 tab daily 5) Theophylline 100mg 1 capsule twice a day 6) Fluticasone 110 ug 2 puffs 3-4 times a day \*No sedation for study. -Pertinent previous echo findings (1/10/23 Nancy Morris, DVM, DACVIM-Cardiology): LA 2.53 cm; LA:Ao1.69; LV 2.58 cm; 1.5 + MR, 2+ TR (2.68 m/s; 29 mmHg-decreased from prior echo - was: 3.6-3.9 m/s; 54-63 mmHg).

**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; 25mm/s, 10mm/mV. The average heart rate is 75bpm (range 55-83bpm). P waves do appear to be conducting to the ventricle given a relatively consistent PR interval. That being said, there is frequent 2<sup>nd</sup> degree AV block present throughout with occasional high-grade intervals. A single APC is identified. ECG diagnosis: Suspect high grade 2<sup>nd</sup> degree AV block with a single APC.

**ECHOCARDIOGRAM FINDINGS**

2D, m-mode, color flow and Doppler imaging is available.

**Left ventricle:** The LV diameter is normal with adequate function. LV wall thicknesses are normal.

**Left atrium:** The left atrium is mild to moderately dilated.

**Mitral valve:** The mitral valve is diffusely thickened with no prolapse into the left atrial lumen. Mild to moderate eccentric mitral regurgitation with a normal velocity.

**Aortic valve/Aorta:** The aortic valve is normal in morphology and mobility. Normal aortic outflow velocity; laminar flow. No aortic insufficiency.

**Right ventricle:** Mildly enlarged PV.

**Right atrium:** Mildly enlarged RA.

**Tricuspid valve:** The tricuspid valve appears mildly thickened with mild tricuspid regurgitation. Velocity consistent with mild pulmonary hypertension.

**Pulmonic valve/Pulmonary artery:** The pulmonic valve is normal in morphology and mobility. Mild pulmonic insufficiency. Normal RVOT velocity; laminar flow. The MPA and peripheral branches are enlarged.

**Pericardium/other:** No pericardial or pleural effusion noted. No obvious cardiac masses.



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**2-Dimensional Measurements**

Ao diam (cm)	1.6
LA diam (cm)	2.6
LA:Ao (Swe)	1.6
IVS thickness (cm)	1.0
LVID diastole (cm)	2.4
PW thickness (cm)	1.1
LVID systole (cm)	1.0
FS (%)	58

**Doppler Measurements**

PV Vmax (m/s)	1.7
AoV Vmax (m/s)	2.0
MR Vmax (m/s)	5.5
TR Vmax (m/s)	3.2
TR PG (mmHg)	41

**INTERPRETATION OF THE FINDINGS**

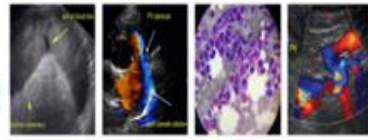
Chronic degenerative valve disease causing mild to moderate mitral and mild tricuspid regurgitation persists. Compared to what is available from the prior study, the structural findings appear largely similar. The LA is mild to moderately enlarged and pulmonary pressures appear stable.

The rhythm diagnosis is primarily low grade intermittent second-degree AV block. This indicates some p waves are conducting to the ventricle, resulting in contraction; however, some are not. There are periods where there is more than one P wave blocked in a row, suggesting an intermittent high-grade issue. This is likely a primary conduction abnormality given the signalment and chronicity; however, **an Atropine challenge is recommended.**

If the AV block resolves and the heart rate responds adequately with a regular accelerated rhythm, then high vagal tone is involved (likely secondary to significant pulmonary disease) There may be a component of both high vagal tone and conduction disease given the history in this case, so even a mild improvement would be notable. If the response is inadequate however, a conduction issue is suspected and a holter monitor is advised. Regardless, what is seen here is unlikely to cause any clinical signs unless extended pauses are present and not captured.

What is not clear in this case is what is the primary cause of collapse episodes. This dog has both pulmonary hypertension which can lead to exertional hypoxia, and bradycardia which may also lead to inadequate cardiac output with activity. Given that the pulmonary pressures were only mildly elevated exam, my assumption is that it is likely a combination of issues leading to collapse. What also difficult in this case is there is little left that we can treat effectively with medications. Increasing the sildenafil to 3 times a day dosing can be attempted, although with mild pressure elevation seen here this is unlikely to be of significant benefit. Assuming conduction disease is present (ie atropine has a lackluster effect), additional heart rate stimulation will be of little benefit given that theophylline is already on board. A pacemaker could be considered as a solution to at least 1 of the problems; however, this is a large procedure for a senior dog with multiple issues. If this would be considered, referral to a local cardiologist is suggested for further evaluation and discussion. We must also stress avoidance in this case as any exertion can lead to clinical issues.

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



**PATIENT**

Zippy Mercier

Elective anesthesia is not advised at this time.

**SPECIES**

Canine

The blood pressure is significantly elevated and may require further medical management, as dictated by Internal Medicine.

**BREED**

West Highland Terrier

**RECOMMENDATIONS**

- Continue Pimobendan and Enalapril as prescribed.
- Reasonable to continue Prednisone, Theophylline and Fluticasone for respiratory disease.
- An Atropine challenge should be administered as discussed above. Consider referral, holter monitor, etc. dictated by the results.
- Can trial increase Sildenafil to 1-2mg/kg PO q8h to assess response.
- Omega fatty acid supplementation and mild salt restriction may be of some long-term benefit.
- Anesthesia is not advised.
- Monitor for development of a cough, labored breathing, exercise intolerance or collapse episodes.

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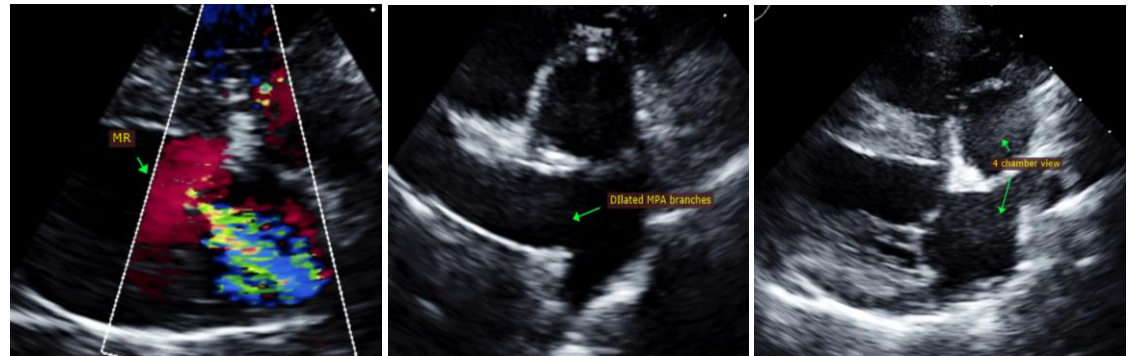
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**PLAN**

- Recommend conservative monitoring with a recheck echocardiogram in 6 months, sooner if any development of clinical signs.

**IMAGES**



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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.

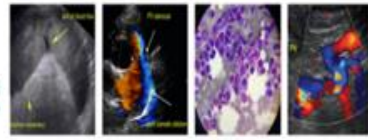
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Thank you for this referral. This report was generated using transcription software, and minor dictation errors may be present. If the clinical or image interpretation does not parallel your findings or if I can be of any further assistance, please contact me.



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Maggie Machen Lamy, DVM  
Diplomate of the American College of Veterinary Internal Medicine (Cardiology)  
info@sonopath.com

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**Echocardiogram performed by:**

Pamela Harrigan, RDCS  
Pet Animal Ultrasound Service (4paus.com)

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