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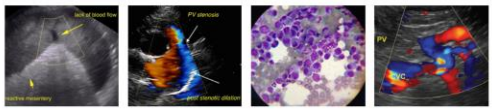

SonoPath
Clinical Sonography & Telecytology
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PATIENT
Milly Anderson

SPECIES
Canine

BREED
Cockapoo

SEX
Female Spayed

AGE
11 years

WEIGHT
25.6lbs

INTERPRETED BY
Maggie Machen Lamy, DVM DACVIM (Cardiology)

IMAGING PERFORMED BY
Pamela Harrigan, RDCS

HOSPITAL NAME
Wood River Animal Hospital

REFERRING VET
Dr. Plunkett

INVOICE
30378

DATE
4/21/23

PRESENTING CLINICAL SIGNS

History: Patient presented on 4/4/23 at rDVM for annual exam. O said Milly gags after drinking walk and has lost half a pound since previous recorded weight. PE found bradycardia, Grade V/VI heart murmur, and increased respiratory effort. Lateral radiographs showed enlarged cardiac silhouette with pulmonary edema. Patient was distressed when laying on side for radiographs. Started Lasix, Pimobendan, and Enalapril. Current dosages: 1) Vetmedin 5mg, SID, 2) Enalapril 5mg, BID, 3) Furosemide 20mg BID.

ELECTROCARDIOGRAPHIC FINDINGS

A six lead ECG is available at 25mm/s; 5mm/mV. Multiple QRS morphologies are present. The upright complex most consistent with a sinus beat has an average heart rate of 50bpm, although sequential beats are difficult to identified. The PR interval is relatively consistent and prolonged at 0.2 seconds. The P wave/sinus rate varies from 80-100bpm with frequent high grade 2nd degree AV block (variable conduction). Two inverted QRS morphologies are also seen. One is consistent with a malignant ventricular origin with frequent VPCs identified. The VPCs are primarily singles and monomorphic; however, a tight couplet is observed (instantaneous heart rate >300bpm). A third complex is appreciated, most consistent with a junctional escape rhythm as no consistent PR interval is seen.
ECG diagnosis: Sinus bradycardia with 1st and 2nd degree AV block (high grade; up to 4:1). Juncture escape rhythm. Malignant VPCs with a single tight couplet.

ECHOCARDIOGRAM FINDINGS

2D, m-mode, color flow and Doppler imaging is available.
Left ventricle: The LV diameter is significantly dilated with adequate function. LV wall thicknesses are decreased.
Left atrium: The left atrium is marked dilated.
Mitral valve: The mitral valve is diffusely thickened with minimal prolapse into the left atrial lumen. Severe eccentric mitral regurgitation. Normal velocity.
Aortic valve/Aorta: The aortic valve appears thickened with borderline increased outflow velocity; laminar flow. Mild aortic insufficiency.
Right ventricle: The RV is moderately dilated. No obvious RVH or evidence of PAH.
Right atrium: Moderate RA dilation.
Tricuspid valve: The tricuspid valve appears normal with mild tricuspid regurgitation.
Pulmonic valve/Pulmonary artery: The pulmonic valve is normal in morphology and mobility. No pulmonic insufficiency. Normal RVOT velocity; laminar flow.
Pericardium/other: No pericardial or pleural effusion noted. No obvious cardiac masses.

2-Dimensional Measurements

Ao diam (cm)	1.6
LA diam (cm)	4.2
LA:Ao (Swe)	2.6
IVS thickness (cm)	0.8
LVID diastole (cm)	5.1
PW thickness (cm)	0.8
LVID systole (cm)	2.8
FS (%)	46

Doppler Measurements

PV Vmax (m/s)	1.1
AoV Vmax (m/s)	2.4
MR Vmax (m/s)	5.4
TR Vmax (m/s)	NM
TR PG (mmHg)	NA

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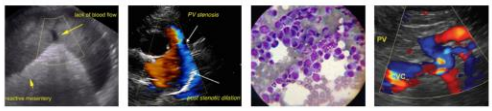

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INTERPRETATION OF THE FINDINGS

Today's evaluation confirms several significant issues in this patient. Most striking, there is a clear bradyarrhythmia present, which shows both 1st and 2nd degree AV block, as well as malignant ventricular arrythmias. The 2nd degree AV block implies P waves are firing without consistent conduction to the ventricle and a junctional escape rhythm is present.

Presumably a separate issue, there is also chronic degenerative valve disease causing severe mitral and mild tricuspid regurgitation. The LA and LV are markedly dilated, indicating an elevated risk for clinical signs going forward. The degree of dilation is likely due to a combination of structural disease and the arrhythmia, as even normal hearts with this degree of bradycardia will show secondary dilation.

AV block is typically idiopathic in origin, with progressive deterioration of the electrical system resulting in persistent bradycardia, significant lethargy and collapse. High grade 2nd degree block is seen here, which will likely deteriorate to complete or 3rd degree block in the near future. Regardless, the treatment is the same and referral for immediate pacemaker consideration should be offered. The finding of malignant ventricular arrythmias is highly concerning as well and does limit medical management options. Heart rate stimulants are contraindicated as this may worsen the VPCs, while anti-arrhythmic options for VPCs will worsen the bradycardia.

Baseline full lab work should be performed, to rule out any electrolyte abnormalities that may be contributing to the arrhythmia. Additionally baseline full body radiographs are recommended to rule out any neoplastic issues. The concurrent issue of VPCs may support myocarditis as a possible issue, and a cardiac troponin (cTnI) could be considered.

Barring any treatable systemic issues, the recommended treatment in this case is supportive care/stabilization for CHF, followed by referral for discussion of permanent pacemaker implantation. It is worth noting that even if a pacemaker is placed this will not correct the severe underlying structural disease and the prognosis may remain poor. If declined, recommend attempt to manage the structural disease/CHF through medications: however, any syncope, lethargy or deteriorating QOL despite therapy would warrant humane euthanasia. At a minimum, consider referral for discussion of options with a local Cardiologist.

Unfortunately, the patient will always be at risk for recurrent CHF, development of arrhythmias/LA tear, syncope and/or **sudden death** in the future.

RECOMMENDATIONS

- Screening senior lab work and radiographs.
- Consider referral for Cardiologist evaluation.
- Administer Pimobendan 0.3mg/kg PO q12h.
- Discontinue ACEI due to intermittent bradycardia and likely hypotension.
- Institute spironolactone 1-2mg/kg PO q12h.
- Administer Furosemide/Lasix 1-2mg/kg PO q12h
- If referral is declined, monitor closely for syncope, lethargy and/or deteriorating quality of life and euthanize in this instance.

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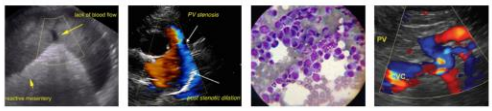

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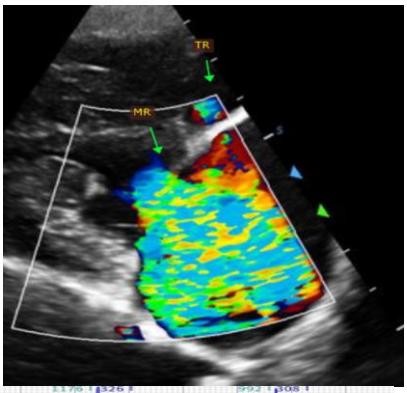
- Close monitoring for development of associated clinical signs (development of a cough, labored breathing, exercise intolerance or worsening collapse episodes) is recommended. Monitoring of sleeping breathing rates is recommended as the best way to screen for CHF at home.
- Activity restriction is advised.
- Omega fatty acid supplementation and mild salt restriction may be of some long-term benefit.

PLAN

- A renal panel is recommended in 1-2 weeks, then every 3-4 months lifelong.
- Recommend conservative monitoring with a recheck echocardiogram in 4-6 months, 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
Diplomate of the American College of Veterinary Internal Medicine (Cardiology)
info@sonopath.com

Echocardiogram performed by: Pamela Harrigan, RDCS
Pet Animal Ultrasound Service (4paus.com)