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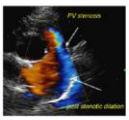
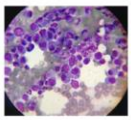
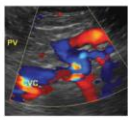




SonoPath
Clinical Sonography & Telecytology
EDUCATIONAL TELECONSULTATION SERVICES™
1-800-838-4268 info@sonopath.com SonoPath.com

PATIENT
Jessy Leuthauser

SPECIES
Canine

BREED
Chow Mix

SEX
FS

AGE
11 years

WEIGHT
44 lbs

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

IMAGING PERFORMED BY
Sarah Pender, CVT

HOSPITAL NAME
SVS Imaging QC

REFERRING VET
Dr. Sullivan

INVOICE
21727

DATE
10/27/21

PRESENTING CLINICAL SIGNS
History: History of chronic pancreatitis. Vomiting, diarrhea, PU/PD x 2 weeks duration. Lost 5#. Arrhythmia upon cardiac auscultation.
Abnormal PE/Chem/CBC/UA Results: complete AV block. Elevated liver values. O declines referral to a specialist.

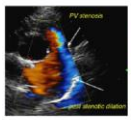
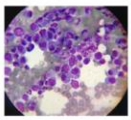
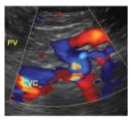
RADIOGRAPHIC FINDINGS *NOTE: Images submitted for supplemental cardiac information only.
Mild cardiomegaly. No obvious evidence of CHF.

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 from an AliveCor monitor; 25mm/s, 10mm/mV. Complete (3rd degree) AV block is present with no P/QRS correlation. The sinus/P wave rate is 150bpm. The ventricular escape rate is 40bpm.
ECG diagnosis: Complete (3rd degree) AV block with a ventricular escape rhythm.

ECHOCARDIOGRAM FINDINGS
2D, m-mode, color flow and doppler imaging is available. Mild diffuse thickening of mitral valve leaflets with no prolapse into the left atrial lumen. Mild central diastolic mitral regurgitation with mild left atrial dilation. Normal MR velocity. Normal LV diameter with adequate myocardial function. The tricuspid valve appears normal with mild diastolic tricuspid regurgitation. Normal velocity. Normal right atrial and ventricular diameter and morphology indicating no overt evidence of pulmonary arterial hypertension. The pulmonic and aortic valves are normal in morphology and mobility. Normal pulmonic and aortic outflow velocities with laminar flow. No obvious aortic or pulmonic insufficiency. No pericardial or pleural effusion noted. No obvious cardiac masses.

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	5.0	2.4	NM	1.4	44	76	0.71
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	NM	2.0	1.1	20	2.9	3.5	2.0
*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 *Note: All measurements based upon multi-modal images and methods. An average value is reported.* 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				5	1.40 (4.5)	2.74 (5.2)	1.60 (4.7)
				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)

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Bonagura et al. Echocardiography: principles of interpretation, Vet Clin North Am 15:1177, 1995	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)

INTERPRETATION OF THE FINDINGS & FURTHER RECOMMENDATIONS

The rhythm diagnosis is 3rd degree AV block with a ventricular escape rate of 40bpm. Significant bradycardia and AV block is usually an acutely progressive disorder, with most dogs requiring transvenous pacemaker implantation to relieve clinical signs such as collapse or lethargy. The overall cardiac dimensions are mildly increased with is likely secondary to bradycardia. Mild MR and TR are primarily due to the arrhythmia (diastolic leaks being seen with AV block), and are hemodynamically insignificant. No additional issues are identified at this time.

In a patient with only reported GI signs (ie no collapse or significant lethargy), the suspicion is that the clinical signs are unrelated and the arrhythmia may be an incidental finding. Pending results of AUS continued treatment for clinical issues is recommended.

AV block is typically idiopathic in origin, with progressive deterioration of the electrical system resulting in persistent bradycardia, significant lethargy and collapse. **An atropine challenge is recommended in any case of bradycardia, although the response is expected to be minimal.** If there is any improvement in resting heart rate, stimulation through theophylline or propantheline (see below) can be attempted. Baseline full lab work should also be performed, to rule out any electrolyte abnormalities that may be contributing.

Barring any treatable systemic issues, the recommended treatment in this case is referral for discussion of pacemaker implantation independent of clinical signs. If declined, heart rate stimulation can be attempted as discussed; however, this is typically of limited benefit. That being said this patient is reportedly asymptomatic and referral has been declined. There is potential that the arrhythmia may remain subclinical for some time. If not corrected however, this patient will succumb to either continued cardiac dilation over time resulting in CHF (which will be difficult to manage in the absence of a normal heart rate), or to worsening bradycardia/syncope/sudden death. The goal would be to stabilize the situation through heart rate management and use medical support to hopefully support the structural disease.

No obvious indication for cardiac supportive medications at this time given only mild atrial dilation. That being said, Pimobendan would be reasonable for long term cardiac support, and should be considered only if GI signs subside. Going forward, unfortunately, the patient will always be at risk for recurrent CHF, syncope and/or sudden death in the future. **If patient develops syncope or QOL suffers, euthanasia or pacemaker implanation will become the only options and this should be expressed to the owner.**

Plan:
Consider immediate referral to a tertiary facility for further evaluation of the bradyarrhythmia and discussion of surgical intervention. Continued systemic work up and treatment of GI signs is recommended.
If referral is declined/not possible, an atropine challenge should be performed (0.04mg/kg atropine IM or IV and assess response in ventricular rate through repeat ECG). If any improvement in ventricular rate is identified, consider oral therapy with theophylline 10mg/kg PO q12h. If no improvement, the medication will likely be of little benefit.
If GI signs resolve, consider Pimobendan 0.3mg/kg PO q12h.

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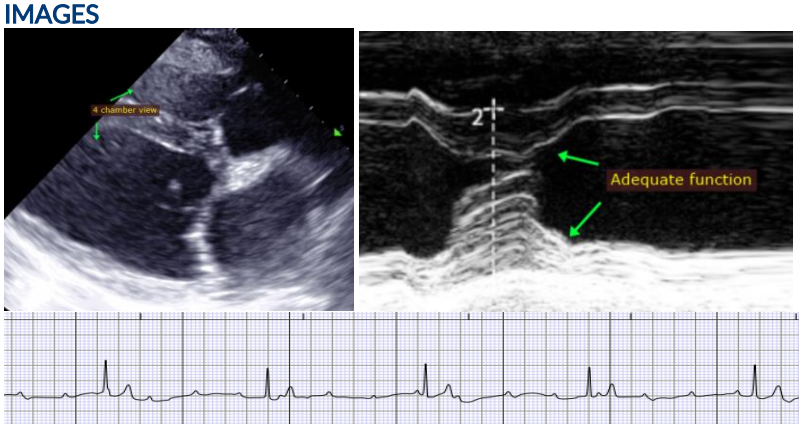
If patient continues to do well at home (ie no collapse or lethargy), reassess echo/ECG in 3-4 months.

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