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Clinical Sonography & Telecytology
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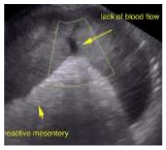
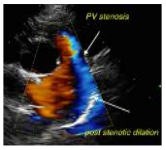
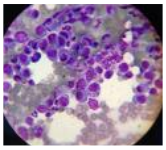
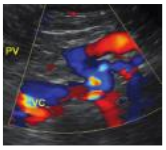

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1-800-838-4268 info@sonopath.com

PATIENT
Carley Jonas

SPECIES
Canine

BREED
Golden Retriever

SEX
FS

AGE
7y

WEIGHT
72lbs

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

IMAGING PERFORMED BY
Amanda Crook
Clinical Sonographer

HOSPITAL NAME
River's Edge PMC

REFERRING VET
Dr. Sullivan

INVOICE
26631

DATE
9/29/22

PRESENTING CLINICAL SIGNS

History: Chronic bradycardia and a recent episode of weakness/collapse. Not on a grain free diet. P on veterinary formulated prescription diet. Currently on interceptor plus.
Abnormal PE/Chem/CBC/UA Results: BP: 179, 184, 182, 186mmHg

ELECTROCARDIOGRAPHIC FINDINGS

A six lead ECG is available at 25mm/s; 10mm/mV. The average heart rate is 55bpm (range 43-60bpm). P waves are not readily visualized; however, high grade (2nd v 3rd degree) AV block is suspected. The QRS morphology is positive with normal dimension likely suggesting a junctional origin. MEA is normal. A single ventricular escape beat is identified. No premature beats, pauses or other dysrhythmias observed.
ECG diagnosis: Suspect high grade AV block; rule out 2nd versus 3rd degree as p waves are low voltage and difficult to visualize consistently throughout.

ECHOCARDIOGRAM FINDINGS

2D, m-mode, color flow and doppler imaging is available. Diffuse thickening of both mitral valve leaflets with no prolapse into the left atrial lumen. There is moderate mitral regurgitation present. The MR velocity is normal. There is severe left atrial enlargement. There is mild left ventricular dilation. Left ventricular systolic function is hyperdynamic during ventricular contraction. There is mildly elevated systolic flow velocity across the aortic valve due to long diastolic filling periods. The aortic valve appears normal. The main pulmonary artery is normal in diameter. The pulmonic valve is normal in appearance. Mild right atrial and ventricular dilation (subjective). Mild thickening of the tricuspid valve with mild TR. Velocity consistent with early pulmonary hypertension. No pericardial/pleural effusion or cardiac masses are seen. **High grade heart block suspected throughout.**

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	4.9	3.2	2.2	2.8	51	82	1.76
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	2.7	1.1	32.7	5..2	5.2	2.5
*Normal chamber parameters expressed as a mean value (SD)				3	1.27 (5.3)	2.46 (2.46)	1.36 (5.5)
				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)
				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)

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

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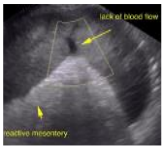

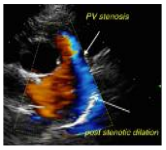

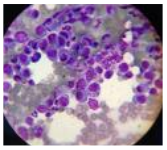
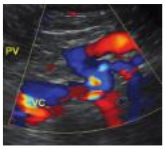

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INTERPRETATION OF THE FINDINGS & FURTHER RECOMMENDATIONS

Today's evaluation confirms a slow ventricular rate, most consistent with high grade second or third degree AV block as the cause of the clinical signs. There are various types of AV block with a range of clinical symptoms from dogs who are asymptomatic to those that are collapsing at home. Most often AV block occurs due to age-related electrical system degeneration, although it can also be encountered with cardiac tumors, in younger dogs associated with idiopathic dysfunction, or with inflammatory diseases such as myocarditis or endocarditis. Systemic issues are also possible albeit rare, such as Addison's disease. Screening may be useful if not recently performed.

Unfortunately, with high grade 2nd degree or 3rd degree block, medications are ineffective and Atropine typically has little to no response. In this case with low voltage p waves, the diagnosis is suspect rather than definitive. It cannot be determined if any P waves are conducting (2nd degree block) or no (3rd degree block); however, the treatment and prognosis is the same. Following an atropine challenge and repeat ECG, the ideal treatment is **placing a permanent cardiac pacemaker.** Pacemaker implantation is fairly routine, minimally invasive, and in cases of uncomplicated heart block is very well tolerated and eliminates any clinical signs due to slow heart rate. No obvious contraindication to surgery is seen here, however given LA dilation and development of clinical signs the prognosis is guarded.

In this particular case, the severe 4 chamber dilation is presumed to be secondary to bradycardia. Concurrent valve disease is also suspected, although organic versus secondary pathology is difficult to differentiate at this time. The main concern in this case is high risk for development of CHF imminently, which is also presumably secondary to bradycardia. Full cardiac support is recommended as below, In addition to referral for pacemaker consultation. This procedure if elected **should be performed as soon as possible**, as the condition is often progressive. If not elected, the condition will likely progress to development of additional clinical signs (collapse, lethargy) as the rate deteriorates to complete dissociation and QOL will suffer. If this develops, humane euthanasia should be considered.

The prognosis with pacemaker implantation is generally good; however, patient will always be at risk for complications and sudden death.

PLAN

Consider full lab work and systemic evaluation to screen for underlying issues. Repeat 6 lead ECG with increased sensitivity for further assessment of AV block. An atropine challenge is recommended; administer 0.04mg/kg IV or IM and repeat ECG in 10 minutes. A negative/lack of response supports AV block, and **immediate referral to a local Cardiologist for pacemaker consultation is recommended**. Institute Pimobendan 0.3mg/kg PO q12h. Institute Lasix 1-2mg/kg PO q12h. Institute ACEI 0.5mg/kg PO q12h. Institute Spironolactone 1-2mg/kg PO q12h. If referral is declined and patient has deteriorating QOL despite medications, euthanasia should be considered.

If patient improves, a recheck echocardiogram in 6 months, sooner if issues arise.

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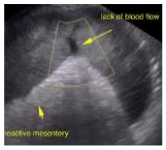
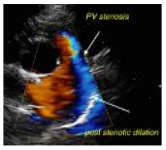
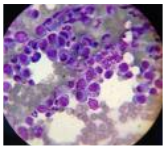
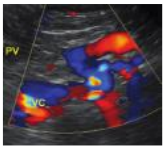

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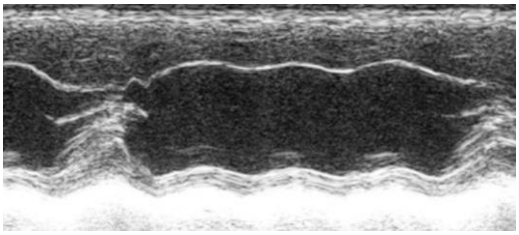
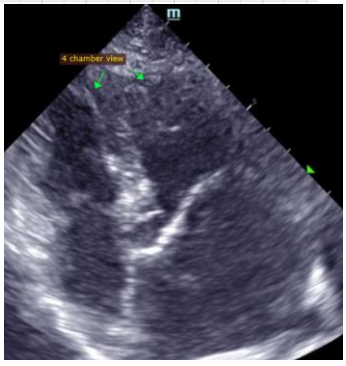
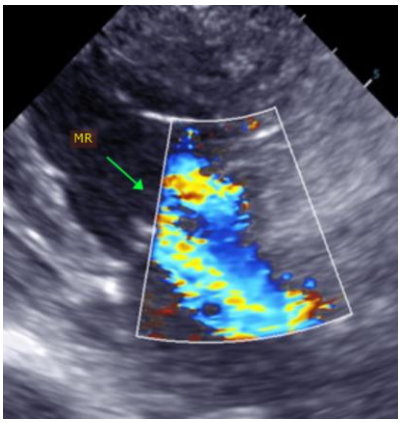
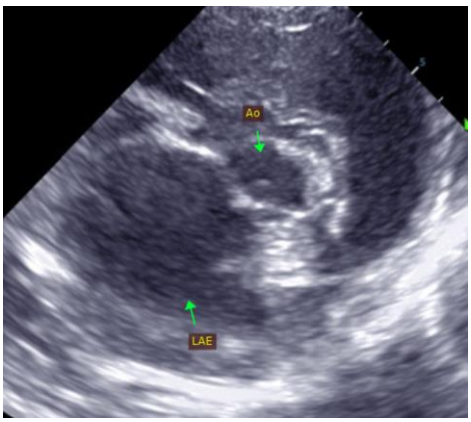
IMAGES





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