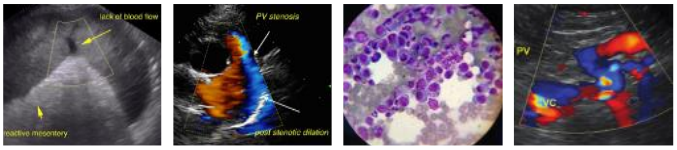
SonoPath
Clinical Sonography & Telecytology
EDUCATIONAL TELECONSULTATION SERVICES™



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

PATIENT
Louie Twible

SPECIES
Canine

BREED
Border Collie Mix

SEX
Male

AGE
7 months

WEIGHT
40.6lbs

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

IMAGING PERFORMED BY
Jacquie Pankatz, DVM

HOSPITAL NAME
Mountain Vista Veterinary Hospital

REFERRING VET
Dr. Pankatz

INVOICE
21069

DATE
9/16/21

PRESENTING CLINICAL SIGNS

History: Louie was adopted in April 2021 from GTHS(shelter). Initial exam revealed a 4/6 left base systolic murmur. Owner initially declined recommendation to proceed with further evaluation; however, they are noticing progressive exercise intolerance over the last few months. Louie unable to go for walks/hikes at this time.

ECHOCARDIOGRAM FINDINGS

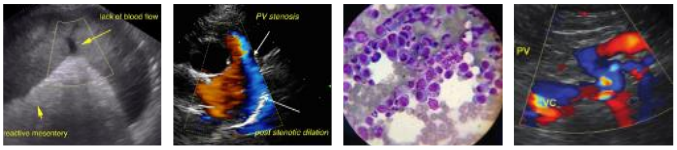
2D, m-mode, color flow and doppler imaging is available. Mild diffuse thickening of mitral valve leaflets with no prolapse into the left atrial lumen. No mitral regurgitation. No left atrial enlargement. Normal/small LV diameter with adequate myocardial function. A muscular ventricular septal defect is identified (0.95cm). The shunt is right to left with flow seen crossing the defect into the aortic root. High velocity (4.5m/s). The aorta is enlarged and overriding the septal defect. The LV wall thicknesses are normal. The tricuspid valve appears thickened with trace tricuspid regurgitation. The right atrium is moderately dilated and the right ventricular is severely hypertrophied and enlarged, consistent with pressure overload. The pulmonic valve is difficult to visualize; however, it appears thickened. Mild pulmonic stenosis is suspected. The overall pulmonary trunk appears small in dimension. Mild aortic 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	NA	NA	NM	1.3	40	73	NM
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	NM	3.9	18.4	2.5	2.16	1.3
*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

SonoPath
Clinical Sonography & Telecytology
EDUCATIONAL TELECONSULTATION SERVICES™



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

PATIENT
Louie Twible

SPECIES
Canine

BREED
Border Collie Mix

SEX
Male

AGE
7 months

WEIGHT
40.6lbs

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

IMAGING PERFORMED BY
Jacquie Pankatz, DVM

HOSPITAL NAME
Mountain Vista Veterinary Hospital

REFERRING VET
Dr. Pankatz

INVOICE
21069

DATE
9/16/21

INTERPRETATION OF THE FINDINGS & FURTHER RECOMMENDATIONS

Complex congenital heart disease is present, most consistent with Tetralogy of Fallot (TOF). This phenomenon includes pulmonic stenosis, a VSD with an overriding aorta and RV hypertrophy. The pulmonary trunk appears small which may suggest atresia +/- valvular stenosis. The VSD is certainly right to left with flow seen exiting the aortic root. The RV changes are severe and concerning for development of clinical signs going forward. Trace leaks are noted in the tricuspid and aortic valves which are hemodynamically insignificant at this time. No additional congenital defects are observed; however, it is important to note that ultrasound is not entirely sensitive for small shunts/abnormalities particularly with complex disease. **Highly recommend referral to an attending Cardiologist in this case for advanced echocardiography and conformation of the diagnosis.**

Unfortunately, surgical options are limited for this particular disease in animals and would require cardiopulmonary bypass. This may or may not be an option at select universities, and further communication with UPenn or UC Davis can be initiated if an option. Medical management is also of questionable benefit; however, Sildenafil can be initiated in an attempt to improve oxygenation. A PCV should be assessed in any case of cyanotic disease, as elevated values may warrant phlebotomy.

Assessment of progression in the future will help predict long term prognosis, which is likely poor due to the complexity of the abnormalities and severity of disease. The reported significant exercise intolerance at such a young age is concerning and quality of life must be monitored carefully. The patient will always be at risk for progression to right-sided CHF, shunt reversal, development of malignant arrhythmias/collapse and/or sudden death going forward. Hypoxic heart disease will often present as marked exercise intolerance, cyanosis and syncope at home.

Omega fatty acid supplementation and mild salt restriction may be of some long-term benefit. Lifelong activity restriction is advised. Elective anesthesia is not advised. If necessary, referral to a facility with an Anesthesiologist should be considered.

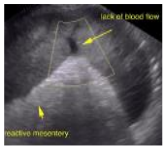
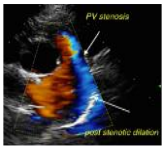
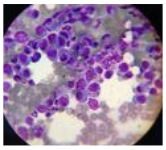
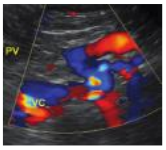
Monitor for development of a cough, labored breathing, abdominal distention, exercise intolerance or collapse episodes.

PLAN

Highly recommend referral in this case to discuss medical and potential surgical options. If elected, consider institution Sildenafil and assess response. Screening PCV with periodic phlebotomy to keep PCV <65%. Monitor PCV every 3-4 months.

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

SonoPath
Clinical Sonography & Telecytology
EDUCATIONAL TELECONSULTATION SERVICES™

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

PATIENT
Louie Twible

SPECIES
Canine

BREED
Border Collie Mix

SEX
Male

AGE
7 months

WEIGHT
40.6lbs

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

IMAGING PERFORMED BY
Jacquie Pankatz, DVM

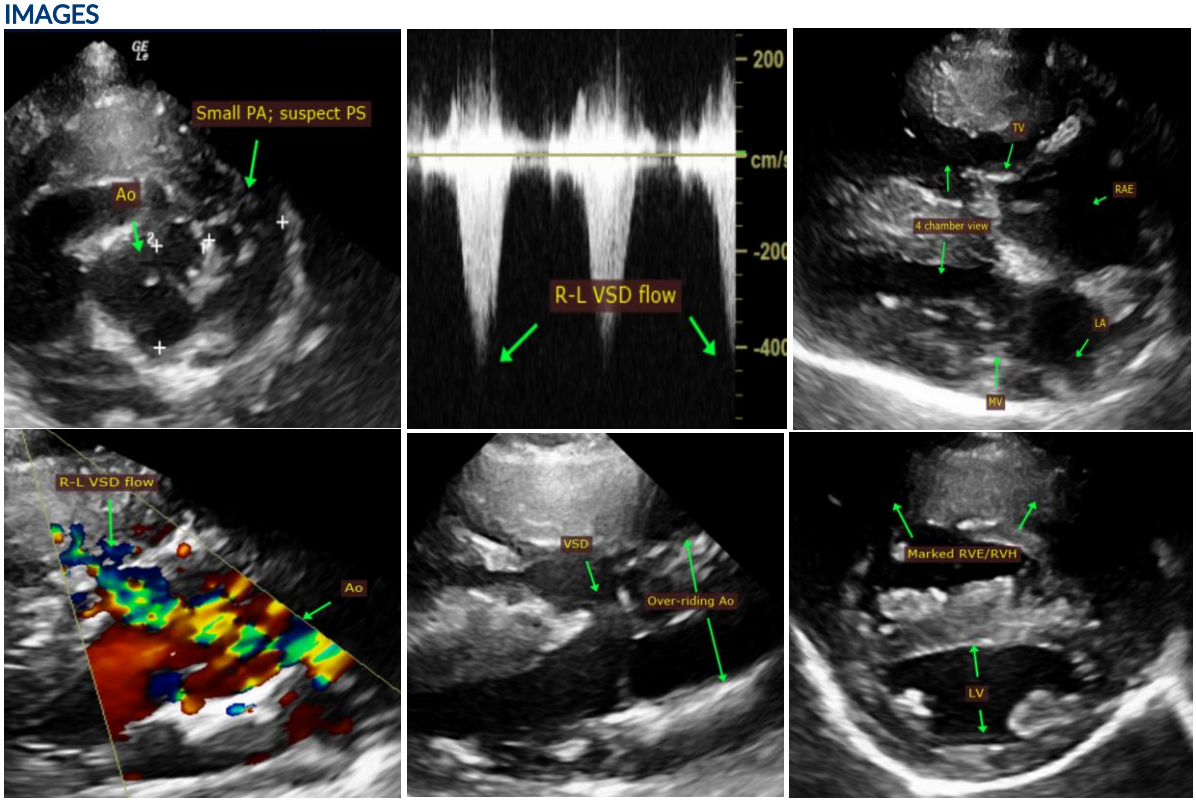
HOSPITAL NAME
Mountain Vista Veterinary Hospital

REFERRING VET
Dr. Pankatz

INVOICE
21069

DATE
9/16/21

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