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Cardiology Case Challenges 2017 Mini Series

Session 2: Feline cardiology case challenges

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Feline Cardiology Case Challenges

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Case 1

Case 1

- 10 yo MC DSH 5.1 kg
- Gr 3/6 left sided systolic murmur detected at routine vaccination
- HR 180 bpm, regular rhythm
- Rest of physical exam is normal

- Clinically normal according to owner
- Owner wishes to investigate murmur

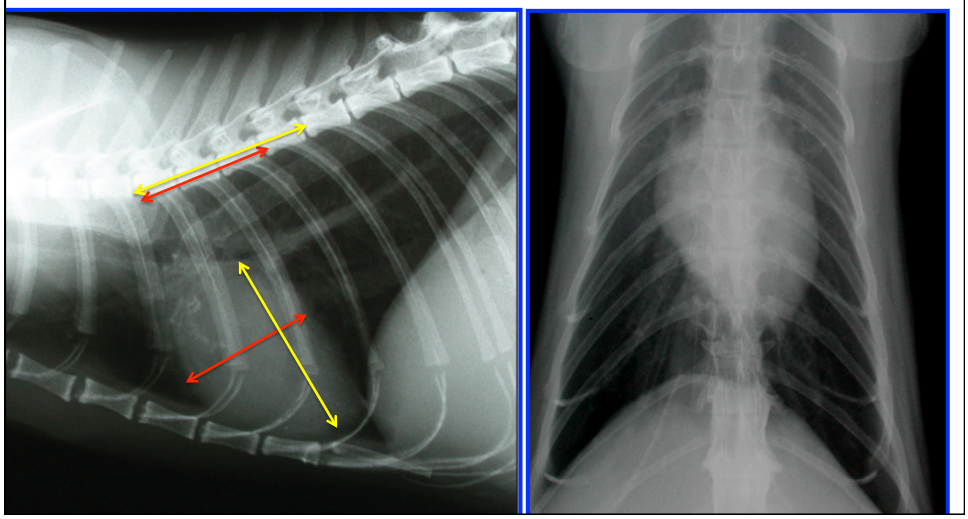
Question

- Which of the following tests would you do next to investigate the cause of the new heart murmur?

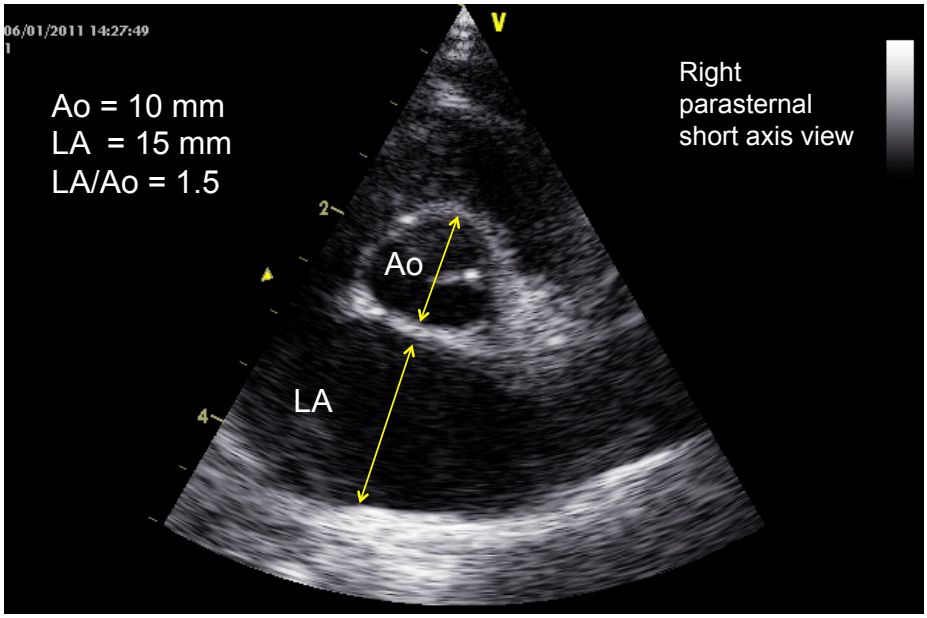
1. Thoracic radiography - CORRECT
2. Echocardiography
3. Biomarkers
4. ECG

Thoracic radiographs show clear lung fields and normal sized cardiac silhouette (VHS on lateral view = 7.2 (3.1 width + 4.1 length)

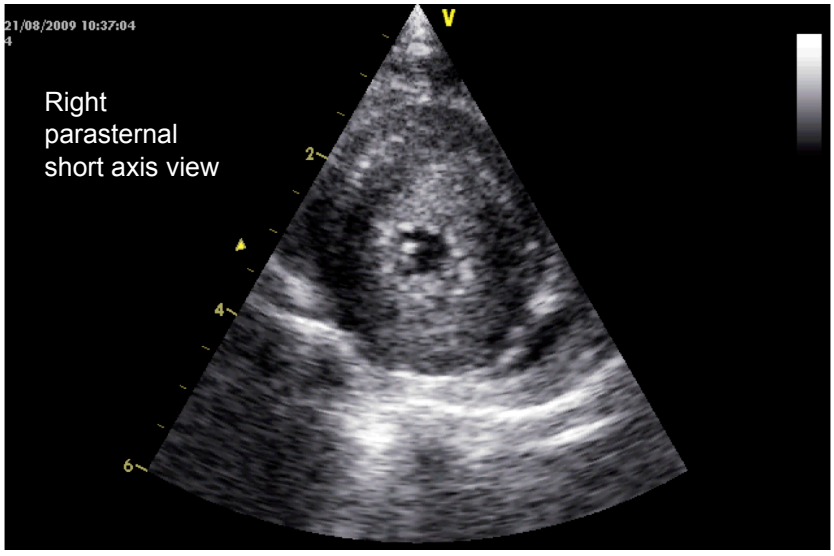
(N.B. normal feline VHS = 6.7-8.1 Ref: Lister AL. JAVMA 2000)



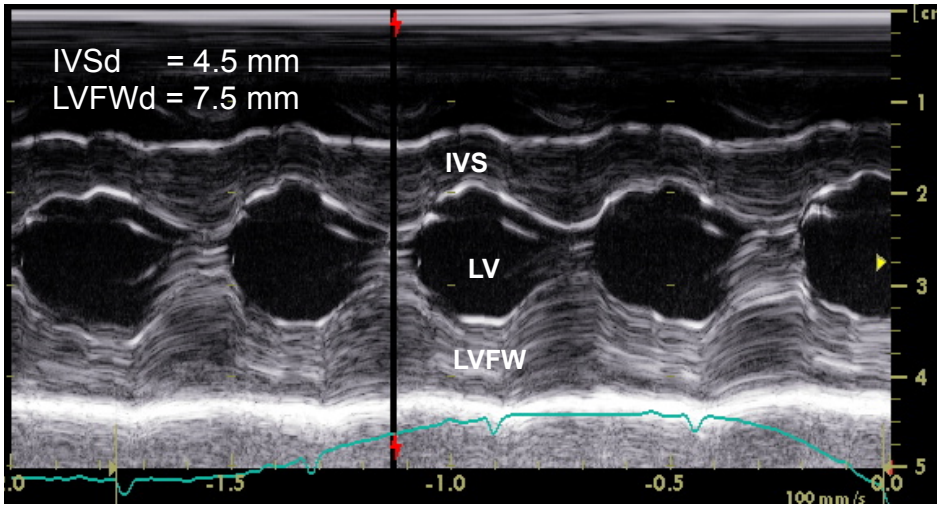
Normal LA size



Echo reveals LV wall hypertrophy



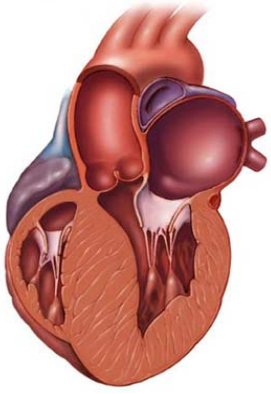
LV M-mode showing free wall hypertrophy



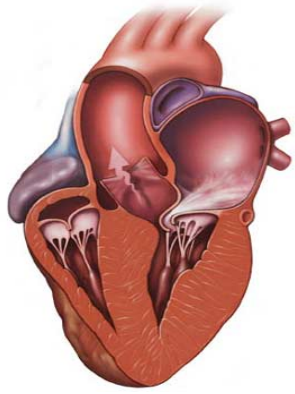
IVSd = interventricular septal thickness in diastole
LVFWd = left ventricular free wall thickness in diastole

Hypertrophic Cardiomyopathy (HCM)

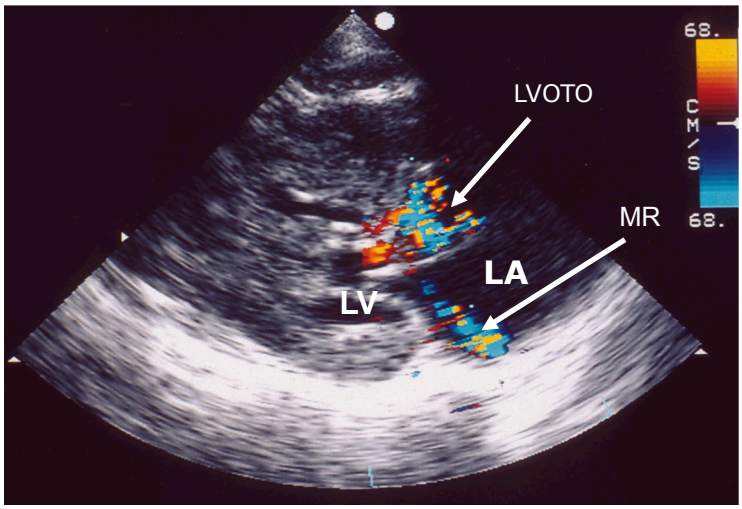
HCM
Non-obstructive form
There is no murmur



H(O)CM
Obstructive form
There is a systolic murmur

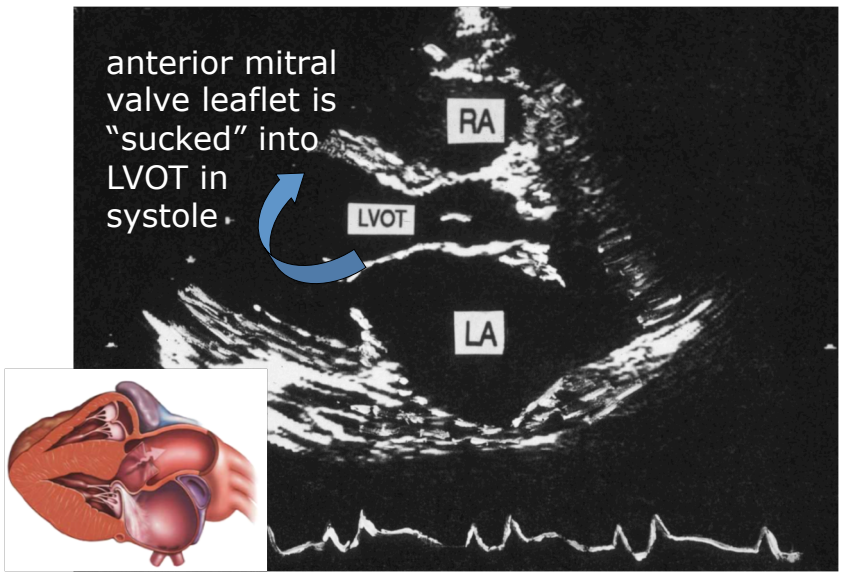


HOCM – what causes the systolic murmur?

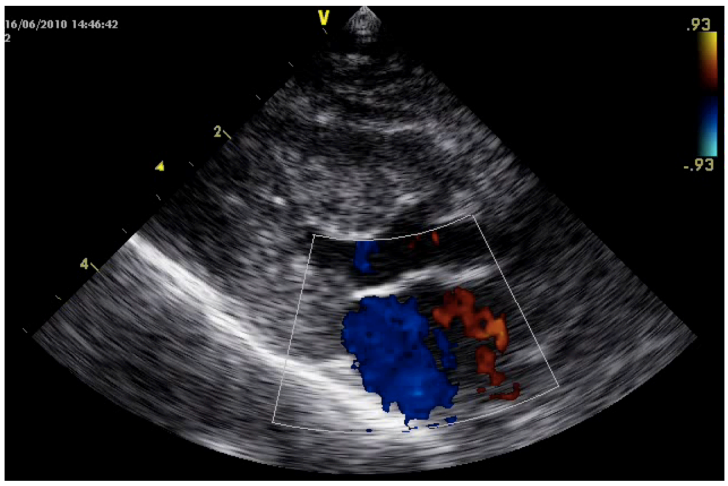


LVOTO = left ventricular outflow tract obstruction
MR = mitral regurgitation

Mechanism of systolic anterior motion (SAM) of mitral valve in HOCM

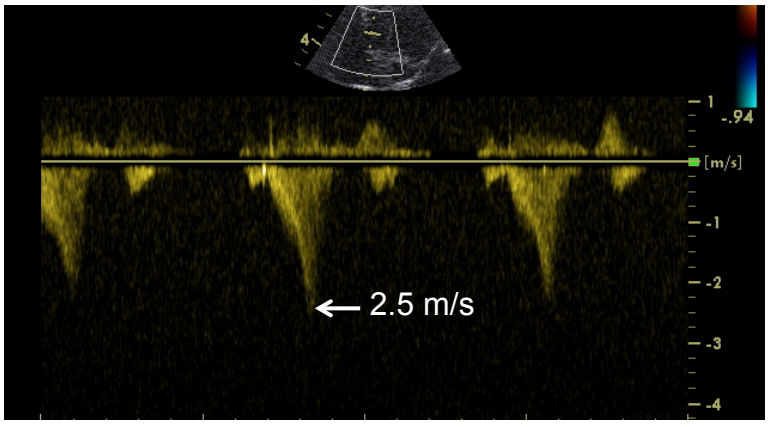


LV long axis view showing SAM



- SAM = systolic anterior motion of the mitral valve
- SAM results in dynamic left ventricular outflow tract obstruction and mitral regurgitation, both of which account for the heart murmur

Continuous Wave (CW) Spectral Doppler evaluation allows accurate assessment of severity of LVOTO by measuring speed of bloodflow in LVOT – the blood flow velocity increases with increasing severity of obstruction caused by SAM



LVOTO max velocity = 2.5 m/s
PG = 4 x (velocity^2) = 4 x (2.5^2) = 2.5 m/s = mild obstruction

Do we need any other information to make a diagnosis?

Due to age of cat, it is important to exclude systemic disease as a cause for the LVH (i.e. secondary HCM):

- Bloodwork including Total T4
- Doppler systolic blood pressure

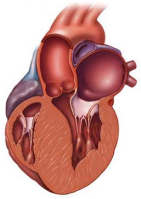
Question

Assuming blood pressure and blood work, including TT4 are normal, what treatment if any is warranted?

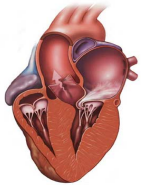
1. No treatment necessary - CORRECT
2. Furosemide
3. Pimobendan
4. ACE-inhibitor

Be aware of theoretical potential contra-indications of ACE-I and pimobendan in HCM / HOCM cats

HCM
Non-obstructive



HOCM
Obstructive



- Pimobendan and ACE-I are vasodilators and will decrease afterload – may worsen LVOTO / SAM
- Pimobendan is positive inotrope and increases myocardial contractility / oxygen demand – not typically indicated in compensated HCM but may be beneficial in HCM cats with acute CHF or advanced disease if LV systolic failure or ventricular arrhythmias are developing (Caution in HOCM cats, as increasing contractility may also increase LVOTO / SAM)

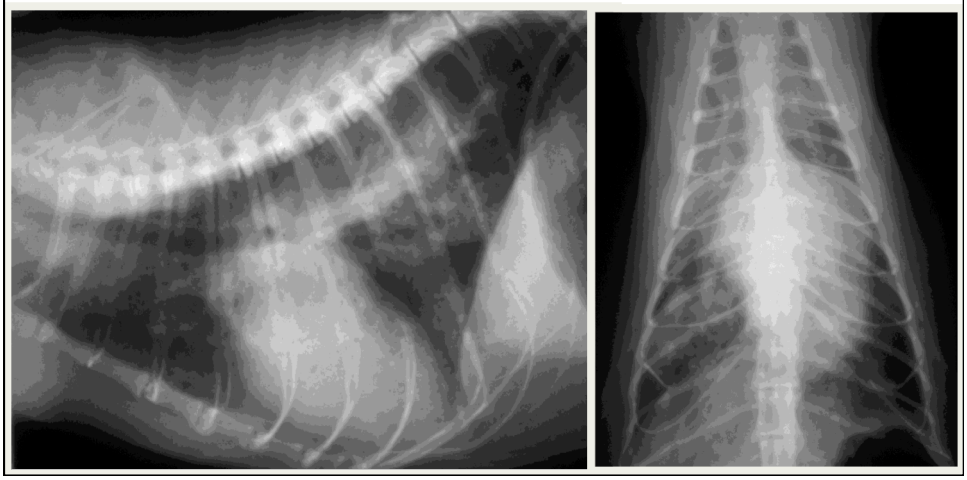
What treatment and follow-up is appropriate for this cat with HOCM?

- As cat has no symptoms of heart disease and LA size remains normal, medical treatment is not warranted
- Typically recommend repeat echo in 9-12 months, or sooner if symptoms develop or if there is an increase in murmur intensity
- Prognosis is currently good, but will depend on rate of HCM progression

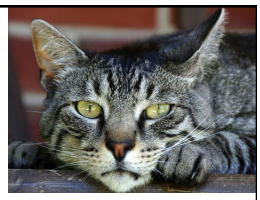
12 months after initial diagnosis…

- Increased respiratory rate for the past week RR > 50 breaths/min
- Decreased appetite for past week
- Very lethargic and hiding from owner

Thoracic radiographs show cardiomegaly and left sided CHF / pulmonary oedema



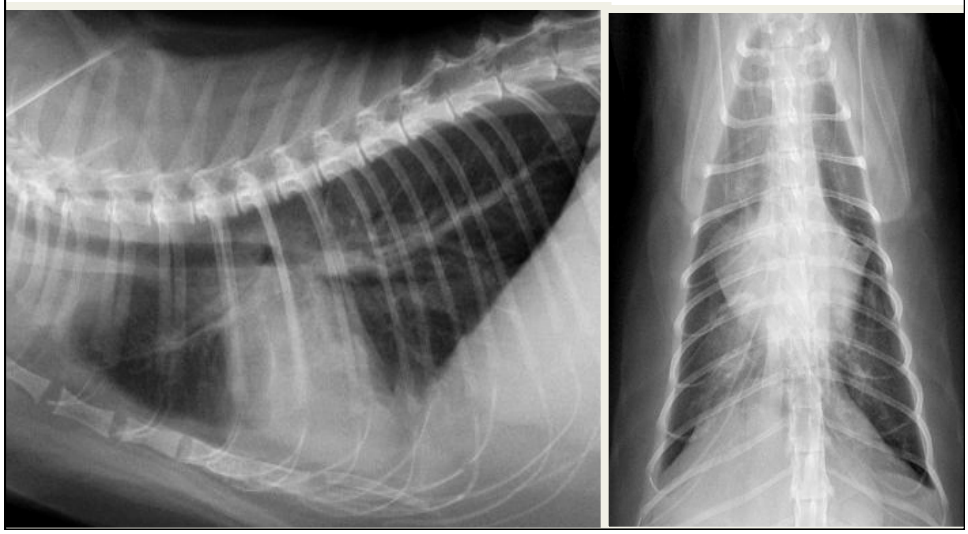
Emergency CHF treatment



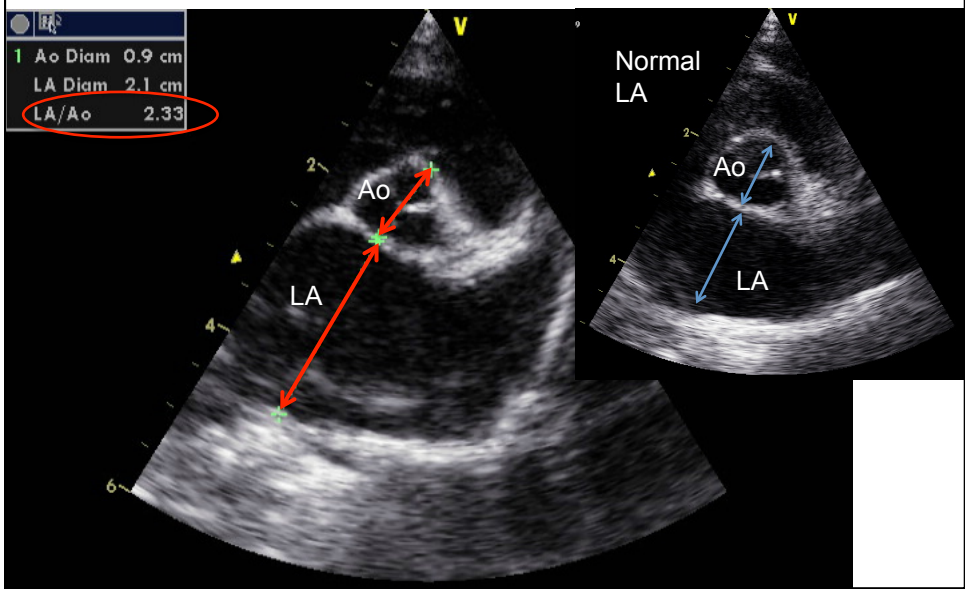
- Oxygen supplementation
- Do not stress cat as likely to be very cardiovascularly unstable
- If too stressed/unstable to place IV catheter initially, give IM furosemide 2 mg/kg q1hr until less dyspnoeic
- Once less dyspnoeic, place IV catheter and continue with IV boluses or start CRI

24 hour recheck radiographs…

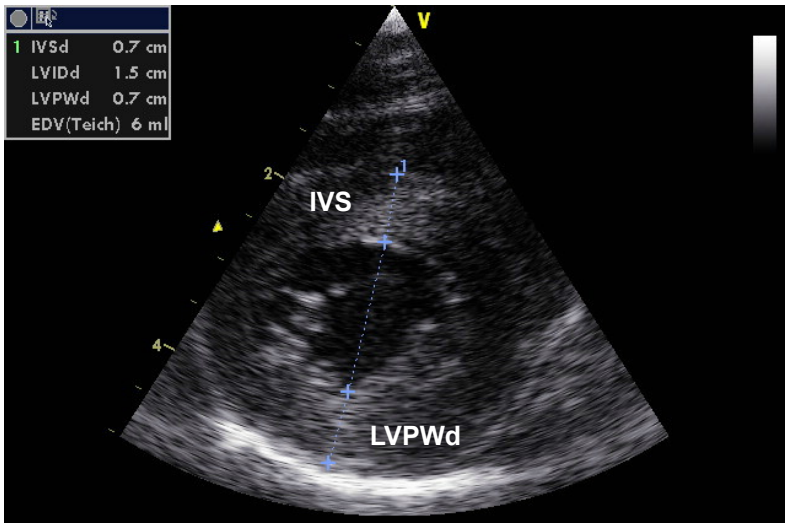
- Pulmonary infiltrate has improved consistent with clinical improvement – good initial response to therapy



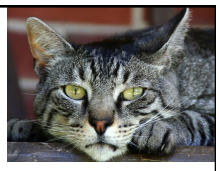
Echo shows severe LA dilation



Echo shows progression of LV hypertrophy, which now involves IVS



Second day of hospitalisation…

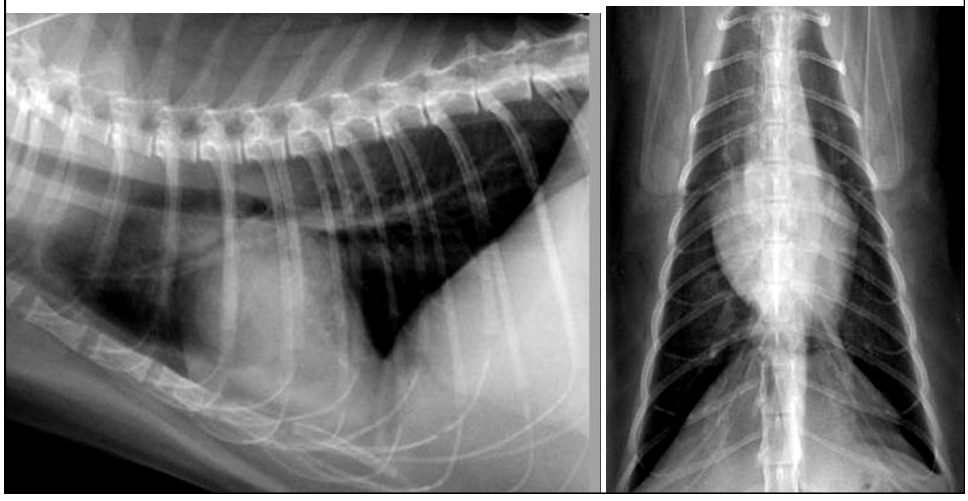


- Continue oxygen therapy if needed
- Continue furosemide therapy but at a decreased dose
- Furosemide should be given IV until RR has normalised on room air, then switch to oral

- Check renal values and electrolytes as azotaemia and hypokalaemia can develop with high dose furosemide therapy, especially in cats not eating in hospital
  - May require potassium supplementation

48 hours after admission…

Pulmonary infiltrate is almost gone and cat's RR is < 30 breaths/min at rest and on room air



Question

Assuming blood pressure and blood work, including TT4 are still normal, what medications would you prescribe for chronic therapy at home?

1. Furosemide only
2. Furosemide + Clopidogrel
3. Furosemide + Clopidogrel + ACE-inhibitor
4. Furosemide + Clopidogrel + ACE-inhibitor + Pimobendan

None of the above answers are incorrect, as each cardiac therapy decision depends on individual patient and owner compliance, concurrent diseases or medications already prescribed and echo findings (e.g. “smoke” in LA, severity of LVOTO, LV systolic function etc)

Case 2

Case 2

- 8 yo Siamese MC 4 kg
- Owner reports lethargy and some recent weight loss
- Gallop sound detected
- No murmur audible
- HR regular but slow at 140 bpm (despite cat being anxious)

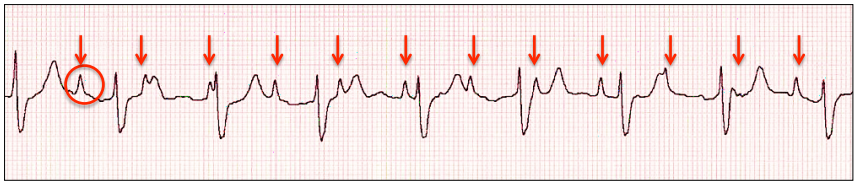
Question

What is your ECG diagnosis?

1. Atrial fibrillation
2. Third degree AV block
3. Ventricular tachycardia
4. Sinus arrest

Third degree AV Block

Lead II 50 mm/s 10 mm/mV

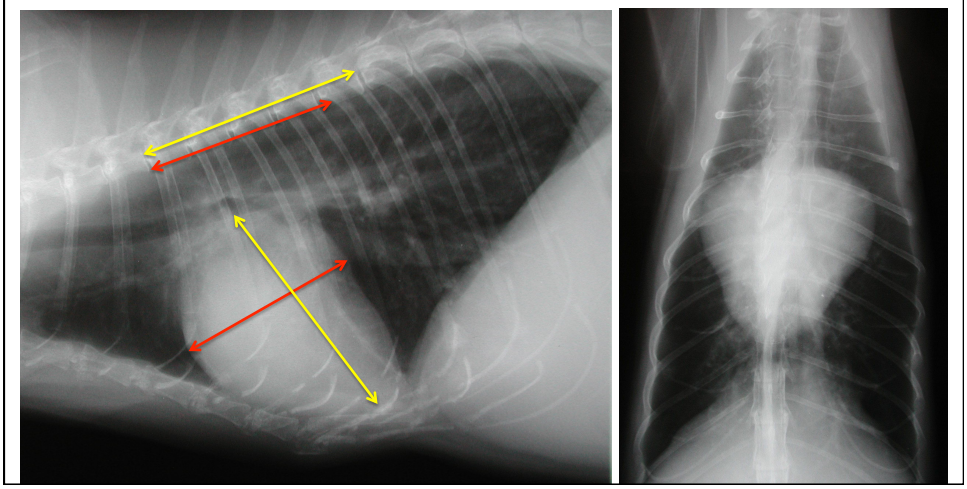


ECG characteristics:

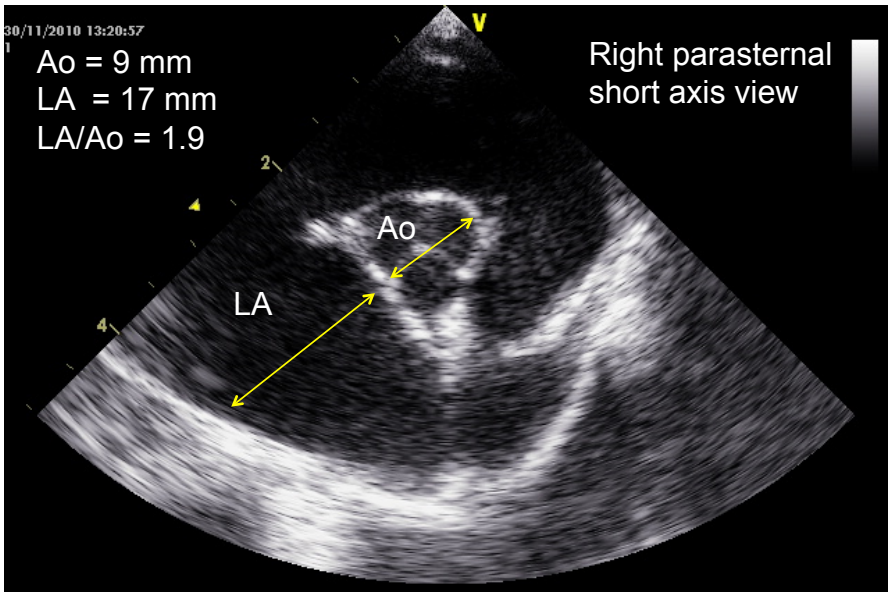
- No association between the P waves and QRS complexes, therefore P-R interval varies
- P wave morphology appears normal
- Wide bizarre QRS complexes which are of ventricular origin (ventricular escape focus), firing at slow, regular rate

Thoracic radiographs show clear lung fields and enlarged cardiac silhouette (VHS = 4.2 + 5 = 9.2)

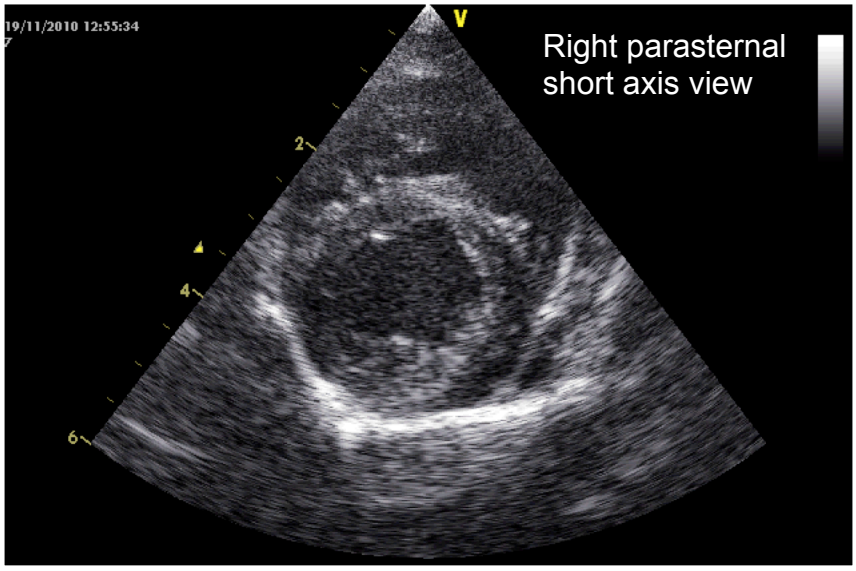
(N.B. normal feline VHS = 6.7-8.1 Ref: Lister AL. JAVMA 2000)



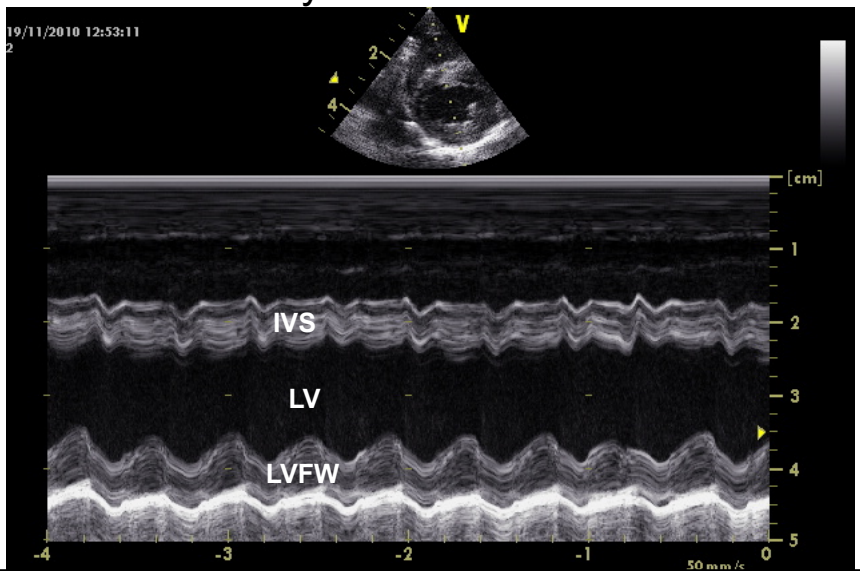
Echo shows LA enlargement



LV short axis view shows systolic and diastolic dysfunction



LV M-mode showing normal wall thicknesses but impaired interventricular septal (IVS) systolic function



Question

Assuming blood pressure and blood work, including TT4 are normal, what is your diagnosis?

1. No evidence of heart disease
2. Dilated cardiomyopathy (DCM)
3. Restrictive cardiomyopathy (RCM) - CORRECT
4. Hypertophic cardiomyopathy (HCM)

RCM Definition:

Hallmark of RCM is diastolic dysfunction with normal or near-normal systolic function and normal LV wall thicknesses

How would you manage this case?

- LA dilation – consider antiplatelet therapy (i.e. clopidogrel, aspirin)
- Diastolic dysfunction – cannot address this directly with medication
- Systolic dysfunction – consider pimobendan (off-label use in cat)
- 3rd degree AV block – no treatment necessary yet as no symptoms and heart rate is maintained > 100 -120 bpm
  - N.B. If symptoms of bradyarrhythmia develop (weakness / syncope), can prescribe sympathomimetic drugs to increase HR (e.g. theophylline, terbutaline) or consider a permanent pacemaker

How would you manage this case?

- Follow up
  - If cat remains stable and symptom-free:
    - Repeat auscultation / ECG in 3 months
    - Repeat echo in 6 months
  - If cat develops symptoms of weakness, syncope, CHF, or if there is a continued decrease in HR cardiac diagnostics should be repeated sooner
- Prognosis
  - Guarded medium-long term
  - Whilst cat has no symptoms of bradyarrhythmia or CHF, reasonably good prognosis short-term
  - Aortic thromboembolism risk increases as heart disease progresses

Case 3

Case 3

- 11 yo FS DLH 4.6 kg
- Owner presented cat for second opinion
- Arrhythmia detected by one of your colleagues on pre-GA check (needs dental)
- Owner has not noticed any symptoms of heart disease at home (cat is not very active and sleeps a lot but owner puts this down to age)

Question

What is your ECG diagnosis?

Lead II 50 mm/s 10 mm/mV

1. Atrial fibrillation
2. Third degree AV block
3. Atrial premature complexes
4. Ventricular premature complexes

Sinus rhythm with frequent ventricular premature complexes (VPCs)

Lead II 50 mm/s 10 mm/mV

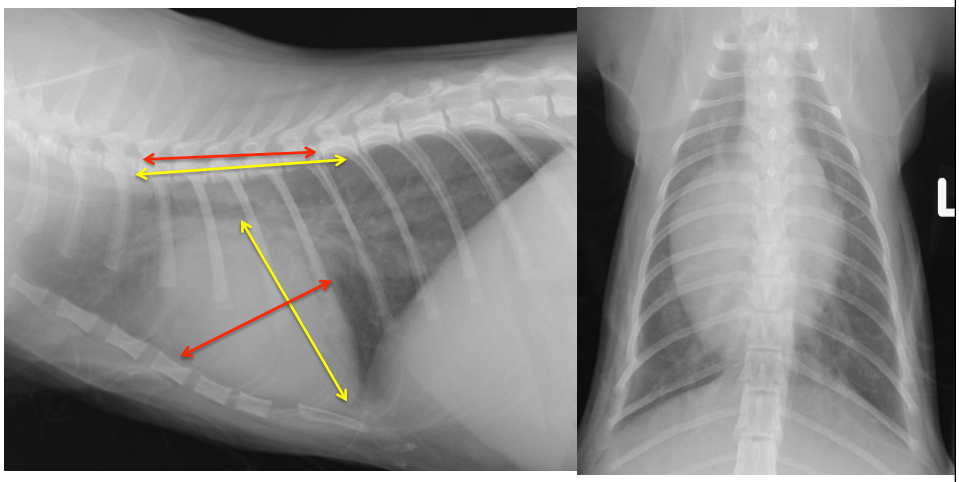
ECG characteristics:

- Underling sinus rhythm
- Frequent VPCs with different morphologies (multiform VPCs)
- VPCs typically have a wide and bizarre morphology and do not have a P wave preceding them

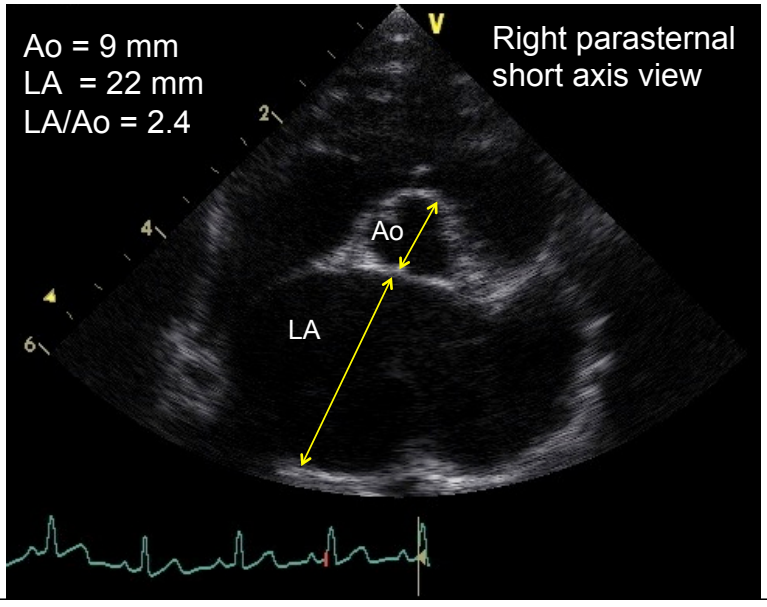
Thoracic radiographs show enlarged cardiac silhouette (VHS = 5 + 5.5 = 10.5)

N.B. normal feline VHS = 6.7-8.1 Ref: Lister AL. JAVMA 2000)

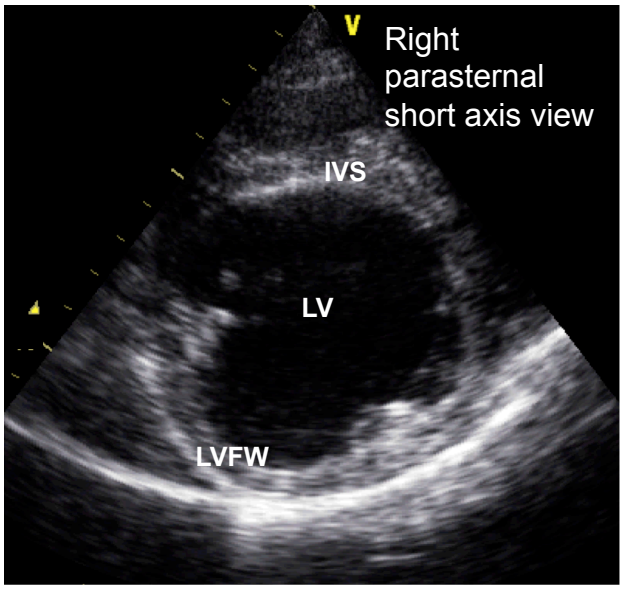
Increased pulmonary interstitial pattern – early CHF?



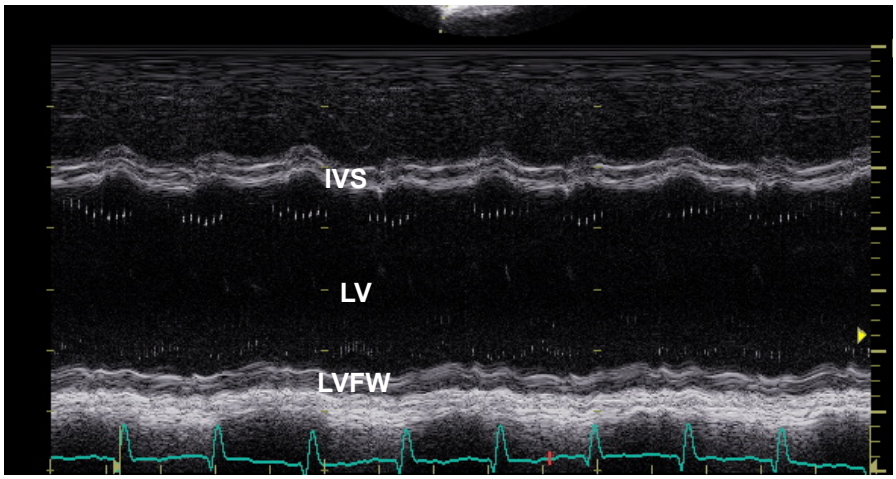
Echo shows severe LA enlargement



LV short axis view shows poor systolic function



LV M-mode view shows poor systolic function



Question

Assuming blood pressure and blood work, including TT4 are normal, what is your diagnosis?

1. No evidence of heart disease
2. Dilated cardiomyopathy - CORRECT
3. Hypertrophic cardiomyopathy
4. Restrictive cardiomyopathy

DCM Definition:

Hallmark of DCM is dilation of the cardiac chambers with myocardial systolic dysfunction.

Rare in cats, always check dietary history as can be caused by taurine deficiency. Can measure taurine level in blood (££)

How would you manage this case?

- LA dilation – consider antiplatelet therapy (i.e. clopidogrel, aspirin)
- Systolic dysfunction – consider pimobendan (off-label use in cat)
- Other medications e.g. ACE-inhibitors? Spironolactone? Taurine?
- If resting RR normal and no CHF yet, no diuretics needed
  - BUT owner must monitor sleeping / resting RR at home
- VPCs – no therapy necessary currently (atenolol or sotalol if VPCs become more frequent or cat develops runs of VT or C/S of weakness, collapse)

How would you manage this case?

- Follow up
  - If cat remains stable and symptom-free:
    - Repeat auscultation / ECG in 3 months
    - Repeat echo in 6 months
  - If cat develops symptoms of weakness, syncope, CHF, cardiac diagnostics should be repeated sooner
- Prognosis
  - Guarded short-medium term
  - Aortic thromboembolism risk due to severe LA dilation
  - Risk of CHF
  - Risk of sudden cardiac death from ventricular tachyarrhythmias
  - NOT good GA candidate for elective dental

6 weeks later…

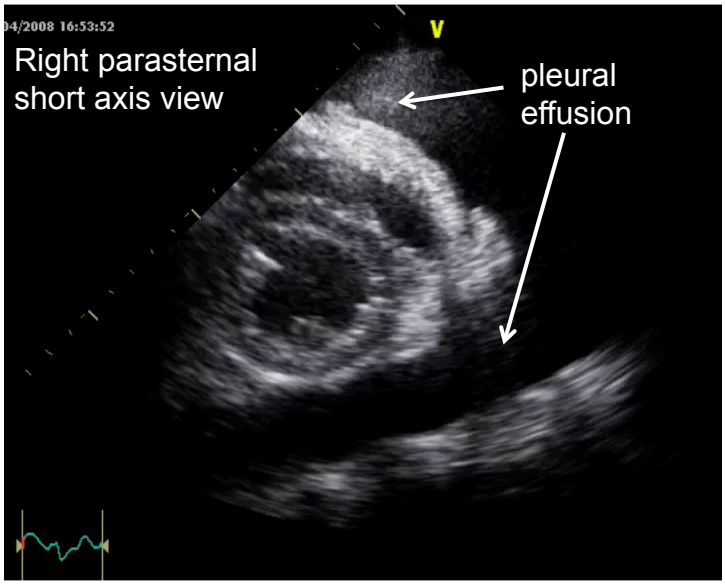
- Cat presents with laboured breathing
- Owner has been counting sleeping RR at home
- Initially after discharge 6 weeks ago, sleeping RR was < 30 breaths/min
- Over past week has increased to 40-50 breaths/ min)
- Last night and this morning owner has noticed abdominal effort to breathing and cat is very lethargic and anorexic

Question

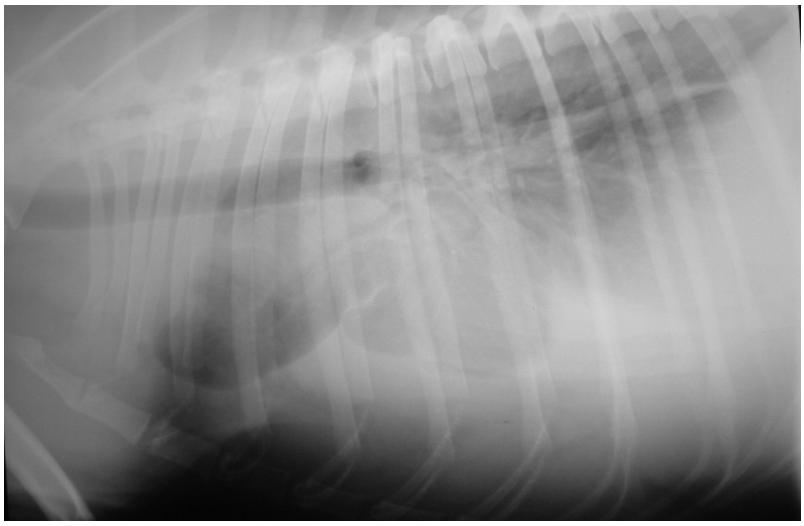
- Which of the following tests would you do next to investigate the cause of the laboured breathing?

1. Thoracic radiography
2. Echocardiography - CORRECT
3. Biomarkers
4. ECG

Ultrasound is the best, minimally stressful method to confirm pleural effusion in dyspnoeic patient



Thoracic radiography reveals a large volume pleural effusion, but cat may be intolerant of handling and restraint necessary for taking radiographs



Now what?

- Oxygen therapy
- Minimal stress
- Thoracocentesis ASAP
- Start diuretics (IV furosemide boluses or CRI)
- Start pimobendan if not already prescribed
- Check Doppler BP
- Check renal values and electrolytes as baseline

Question

What medications would you prescribe for chronic CHF therapy at home?

1. Furosemide only
2. Furosemide + Clopidogrel
3. Furosemide + Clopidogrel + ACE-inhibitor
4. Furosemide + Clopidogrel + ACE-inhibitor + Pimobendan

None of the above answers are incorrect, as each cardiac therapy decision depends on individual patient and owner compliance, concurrent diseases or medications already prescribed and echo findings (e.g. “smoke” in LA, severity of LVOTO, LV systolic function etc)

Case 4

Case 4

- 5 yo FS Ragdoll 3.9 kg
- Owner found cat in garden unable to use hindlegs (had been normal 2 hours prior)
- No known trauma
- Vocal, very distressed and open mouth breathing when found by owner
- No previous health issues

Physical examination findings

- Regular tachycardia
- Dyspnoea with open mouth breathing
- Absent femoral pulses
- Painful, firm cold hindlimb muscles
- Unable to bear weight on HL, proprioceptive deficits

Feline aortic thromboembolism (FATE)

- Remember four "**P**"s (for affected extremities):

1. **P**ARALYSIS / PARESIS
2. **P**AIN
3. **P**ULSELESNESS
4. **P**OLAR (cold)

Question

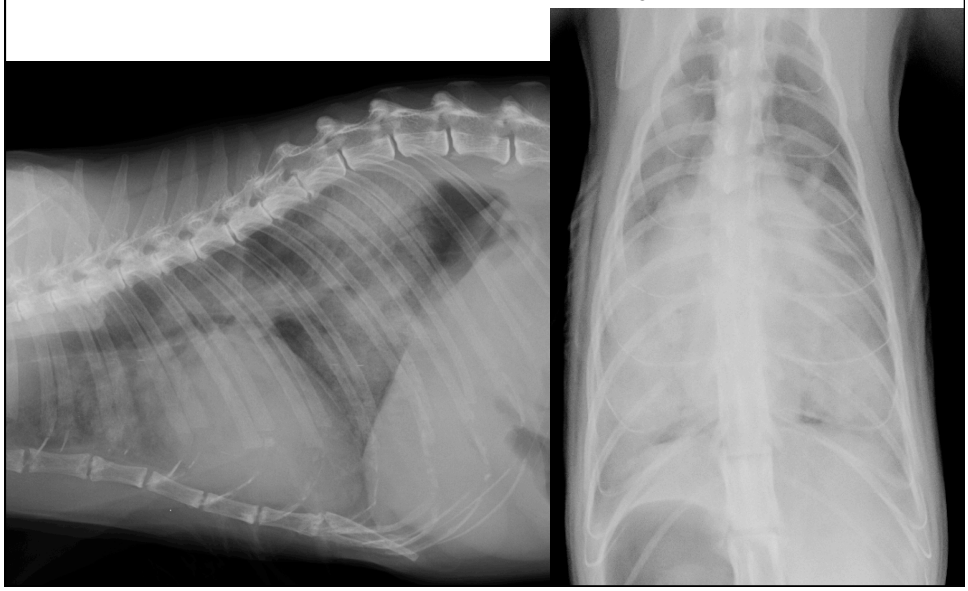
In cats that suffer from an aortic thromboembolic episode, which is the most common site of arterial obstruction?

1. Renal artery
2. Distal aorta – CORRECT (> 90% cases)
3. Left brachial artery
4. Right brachial artery

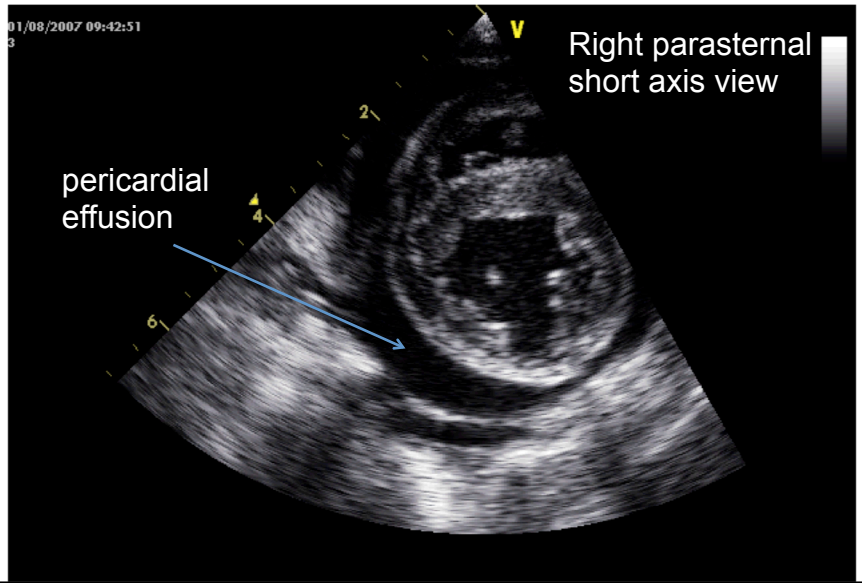
Cat with bilateral hind limb paralysis due to FATE

Cat with right forelimb paralysis due to FATE

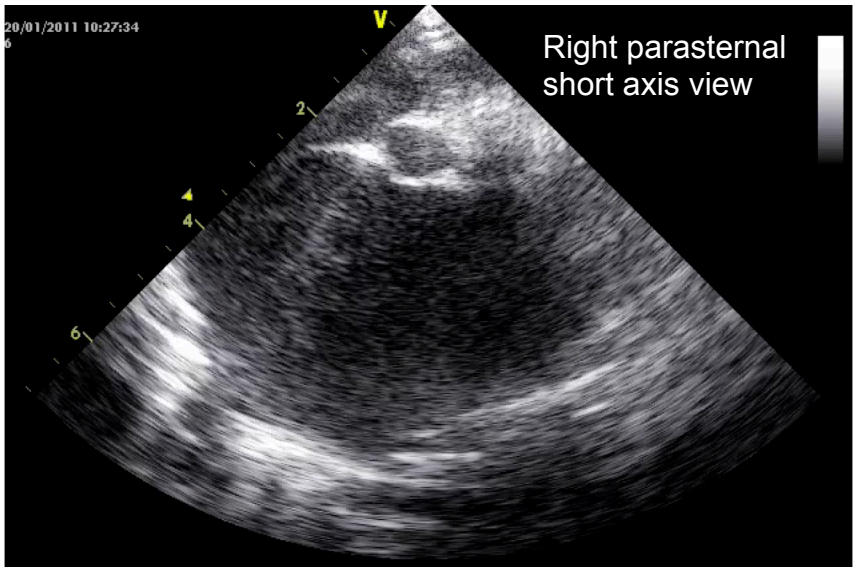
Thoracic radiographs show cardiomegaly and left sided CHF / pulmonary oedema



Cats in CHF often have a small pericardial effusion – no need to drain as should resolve with CHF therapy



“Smoke” (spontaneous echo contrast) in LA



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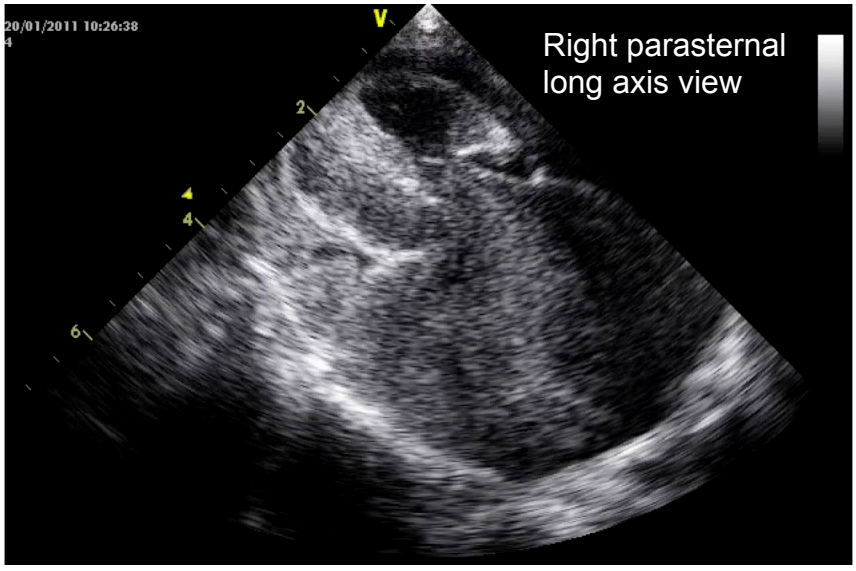
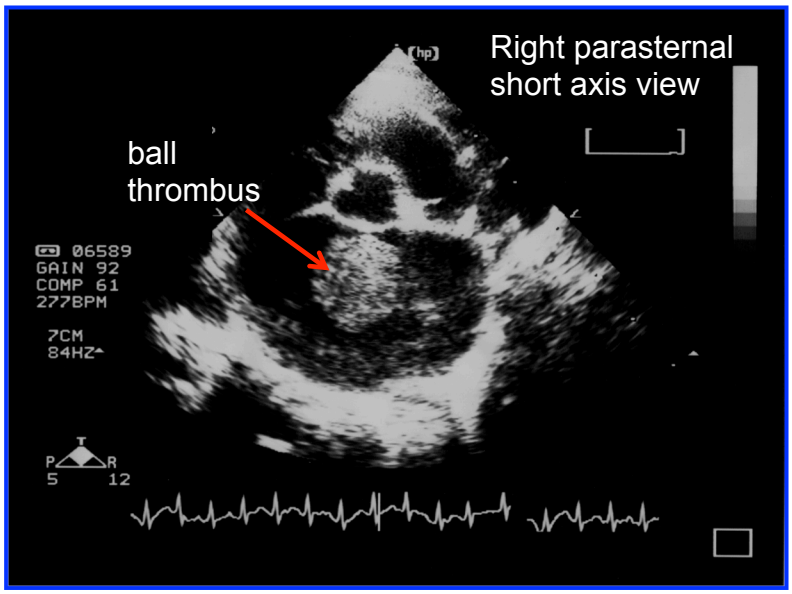
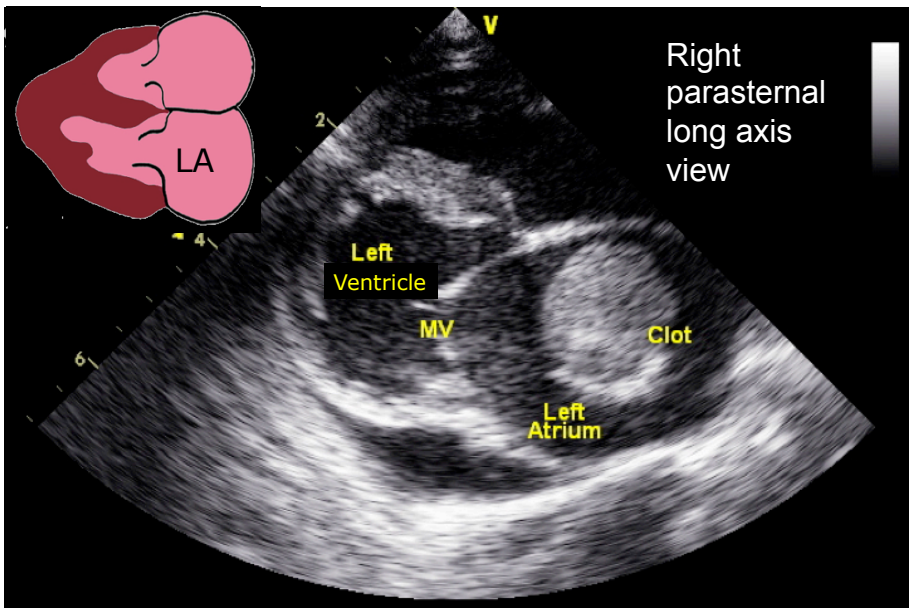




Large mobile thrombus in the left atrium

Large mobile thrombus in the left atrium



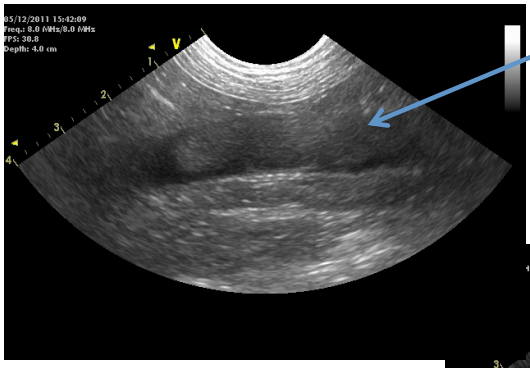
Large mobile thrombus in the left atrium

Would you need any further diagnostic information?

- Bloodwork (incl T4? – only 5 years old)
- Blood pressure (high BP usually associated with increasing age)

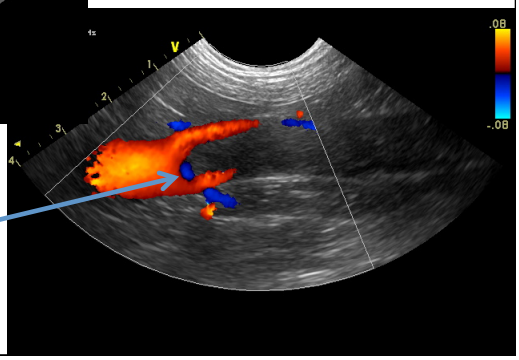
- Clip claws to check for bleeding
- Check for Doppler blood flow in affected limbs
- Biomarkers? Muscle enzymes?
- Abdo US
  - look for thrombus in abdominal aorta

Thrombus in abdominal aorta

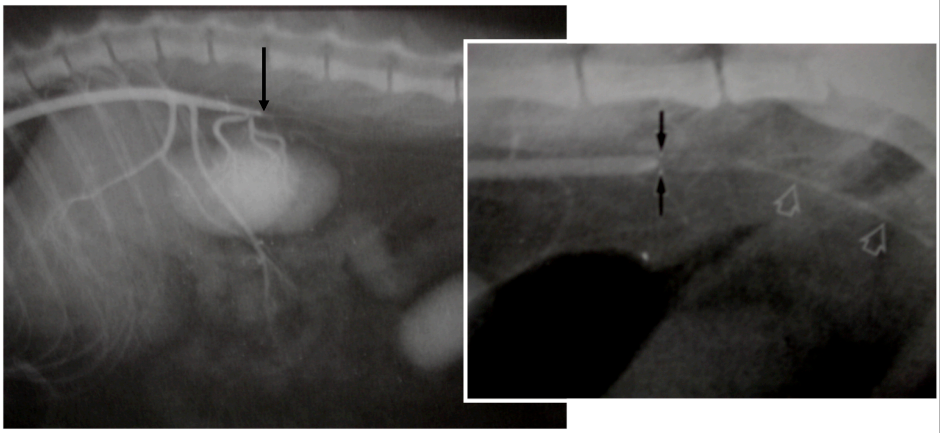


Large thrombus

Colour flow Doppler imaging demonstrates occlusion of blood flow by thrombus



Contrast studies of cats with FATE



White contrast material in the aorta stops at the site of the thrombus

Very small amount of contrast material is seen after the aortic trifurcation

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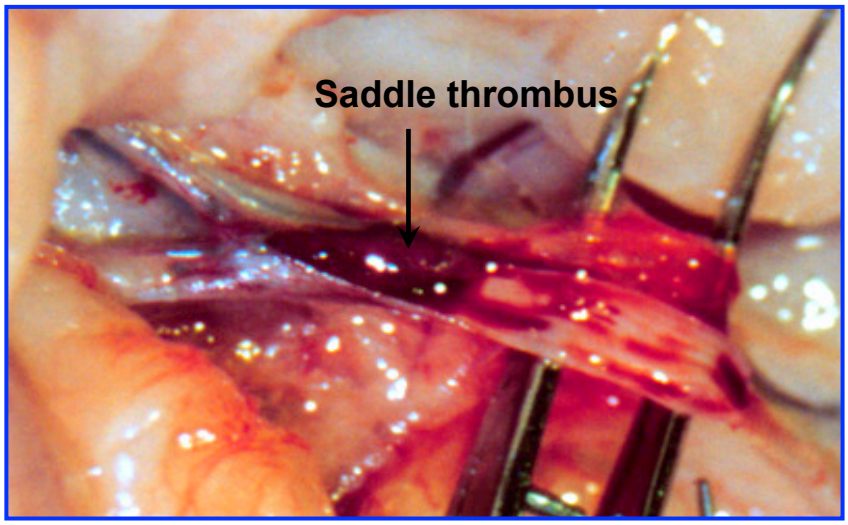


Post mortem specimen of a terminal aorta from a cat with saddle thromboembolus

FATE - Emergency care

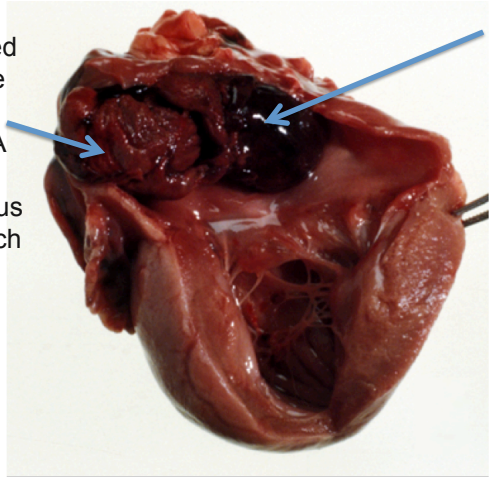
- Pain control (opioids rather than NSAIDS)
- (+/- vasodilators)
- Prevent additional thrombus formation (heparin, clopidogrel)
- Address congestive heart failure (diuretics)
- Address underlying heart disease (pimo? ACE-I? antiarrhythmics?)
- Supportive care
  - Maintain body temp, hydration, nutritional support, electrolyte balance, monitor blood parameters and limb viability etc.

How would you manage this case?

- Follow up
  - If cat recovers well from FATE episode without complications i.e. reperfusion syndrome, skin necrosis, recheck auscultation q 3 months, repeat echo/ECG in 6 mos or sooner if C/S or change in arrhythmia severity
- Prognosis
  - Guarded short-medium term due to severity of myocardial disease, CHF and complications of FATE
  - – Repeat FATE episode is likely

Large thrombus in cat's left atrium at post mortem

Older organised thrombus – the presence of a thrombus in LA will stimulate further thrombus formation, which is why antiplatelet / anticoagulant therapy is prescribed



Newly formed thrombus adhering to older thrombus


Questions?
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