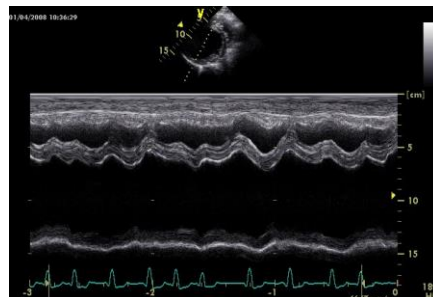




Cardiovascular Emergencies Mini Series

Session Three: Dyspnoeic Patients – Congestive Heart Failure

Rachel James MA VetMB CertSAM DVC MRCVS
RCVS Recognised Specialist in Veterinary
Cardiology





James Specialist Veterinary Cardiology

Help my patient can't breathe

Rachel James MA Vet MB Cert SAM Cert VC DVC MRCVS

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Severe respiratory distress is often a life threatening situation and therefore increased stress MUST be avoided. There are many occasions when immediate therapy is imperative often with in complete diagnostics in order to save the patient.

It is important to remember panting is a way of dispelling heat and does not necessarily signal distress in dogs, however in cats usually is associated with stress / respiratory distress. Dyspnoea is defined as a difficulty and discomfort in breathing, (ie laboured breathing). Tachypnoea is defined as a fast breathing rate without effort.

In clinical practice the most important question is whether the patient is dyspnoeic due to a cardiac or respiratory cause.

History

The signalment of the patient and recent history can be really helpful in deciding what the best emergency therapy is for each individual. As frequently this may have to be done before a detailed history can be taken.

For example; Signalement – very important

- Brachycephalic dogs – BOAS, hot weather etc
- Yorkshire terrier - Collapsing trachea
- Puppies – infectious / congenital disease

The presence of pre-existing disease is important and current therapy. Other important questions include:

- History of trauma, access to poisons
- Cough present? Duration, timing, progression, nature. For example cardiac patients tend to cough when they get up from sleep due to accumulation of pulmonary oedema in the lungs, or post lying down for a period of time, whereas tracheal collapse dogs tend to cough post excitement or exercise.
- Exercise intolerance, 'slowing down' is a common historical change present in some dogs. Cats in heart failure frequently present with a change in behaviour most frequently going outside less and hiding more. Many owners will describe how their cat will often stop sleeping on the bed or their favourite chair, but interestingly often revert back to their normal behaviour once they are stable on medication.
- Weight loss in the background of a normal appetite is also classical, this type of cardiac cachexia is most frequently seen in large breed dogs and they can drop many kilograms in a few weeks.
- Breathlessness is also a common sign with owners reporting inappropriate panting whilst resting at home in many dogs with heart failure.
- Syncope / seizures
- Change in bark, if the dog had developed a high pitched squeaky bark then this can often be a sign of laryngeal paralysis. Sometimes owners will describe the dogs as having rattling chests or wheezing when they are trying to describe inspiratory stridor.
- Any vomiting / regurgitation?
- Any other medical conditions?
- Other medication, concurrent illnesses, Dogs with Cushings are frequently in a hypercoagulable state, predisposing them to developing PTE.

Clinical examination

- DO NOT STRESS

Observation is so important to assess patients, a careful note of the patients:

- Stance – are they able to lie down? In sternal? Are they showing an air hunger position with their head stretched out?
- Position – are the elbows abducted trying to increase the lung volume?
- Body condition score – has there been sudden weight loss indicating cardiac cachexia? Many respiratory patients tend to be overweight and don't tend to lose weight in sharp contrast to cardiac patients.
- Respiratory pattern – this is very important. In the normal animal inspiration is the longer phase with mechanical effort to lift the ribs up and out and then the expiratory phase is short and passive. The normal process of breathing relies on the elasticity of the normal lungs to recoil back to their normal size as air is expelled from the chest. When the lungs are stiff due to fibrosis or presence of fluid they are unable to recoil and therefore the patient must use abdominal effort to expel air. This leads to a prolongation of the expiratory phase and increased abdominal effort. Animals with pleural effusion tend to have rapid breathing with shallow breaths. Animals with severe pulmonary oedema have much more marked movement of their thoracic cavity and frequently become very tired showing paradoxical breathing if they have been dyspnoeic for some time.
- Respiratory effort
- Movement – severely dyspnoeic animals are reluctant to move and tend to wander around and then stand with an air hunger position or in cats many will lie down in sternal.

A table to show the different clinical signs that can be seen with cases of respiratory and cardiac causes of dyspnoea. It is however important to remember that many older animals will have concurrent disease and a combination of cardiac and respiratory disease is common.

	Cardiac	Respiratory
HR	>160	<140
Arrhythmia	Common	Sinus arrhythmia / sinus tachycardia
Murmur	Small breeds >3 Large breeds doesn't help	Small breeds common as concurrent disease but usually <2
extremities	Large breeds – cold lips / jowels / extremities Can be seen in severe cases in small breeds	normal
Lungs sounds	Usually harsh, rarely soft crackles	Loud crackles frequently present
Coughing	Few weeks duration and progressive Night time and just getting up frequency	Often history of coughing for months Usually when excited or pulling on lead
BCS	Sudden weight loss	Usually over weight

Emergency therapy

In many dyspnoeic cases, the animal is so sick that emergency treatment needs to be instigated immediately and history and clinical examination are done at a later stage or by another colleague. The main stay of therapy is oxygen therapy and furosemide in cardiac patients and bronchodilators and corticosteroid therapy in respiratory cases. It is imperative that the distinction is made as corticosteroids will cross react with aldosterone receptors in cardiac patients leading to a severe and very detrimental deterioration in clinical signs.

- Oxygen
 - Flow by
 - Nasal prongs
 - Oxygen cage
- Sedation? – In some patients, Irish Wolfhounds being a classic example, they become very stressed and this becomes to a point of detriment and sedation with butorphanol is critical as they can become very hyperthermic and more breathless panting to try and reduce their body temperature. Once calm with mild sedation usually a dose of 0.1 - 0.25mg/kg Butorphanol is enough to encourage them to stop panicking and relax. This allows the clinician to provide oxygen, cooling fans and appropriate therapy.
- I/v access if possible- This has to be judged on the initial stress of placing the catheter. Using EMLA cream can be very useful and should always be used in blood sampling in cats.
- Specific therapy for the disease process.

Emergency Diagnostics

Once stable enough or if the patient is not too critical on initial presentation then emergency diagnostics should be performed. Echo is a very useful tool in these situations where after a short clip and gel an animal can be imaged easily in sternal recumbency and a fast diagnosis made.

For example if an animal is in left sided congestive heart failure the left atrium would be enlarged and in dogs the left ventricle as well. If there is a pericardial or pleural effusion, these are very easy to identify. If there is no cardiac enlargement a large lung mass can often be easy to visualise. Only if an emergency echo / thoracic ultrasound is negative would I advise thoracic radiographs in a dyspnoeic patient.

Once a patient is stabilised then, for example once CHF has been treated then thoracic radiographs should be taken to make an accurate diagnosis and to check any residual pulmonary oedema and rule out any other causes of thoracic disease.

In Emergency cases of left sided congestive heart failure

- 2mg/kg furosemide (ideally i/v but i/m if access is an issue)
- Hourly furosemide 1mg/kg until control of respiration
 - Dogs up to 12mg/kg total daily dose
 - Cats up to 8mg/kg unless exceptional circumstances
- Dogs – i/v pimobendan
- Cats – i/v pimobendan off licence (don't give if a loud murmur due to HOCM)
- Nitroglycerine ointment (percutol) in groin (label kennel clearly!)
- Continue oxygen
- If effusion present needs draining ASAP
- Water at all times
- Temperature control – Many dyspnoeic patients can become very hot
- Blood for electrolytes and BUN, creatinine at a minimum daily when on i/v furosemide
- Potassium supplementation for ALL cats
- Encourage to eat
- IF BP adequate then start:
 - ACEI, taper dose, start at a low dose initially and gradually increase
 - spironolactone 2mg/kg with food. This is not used primarily as a diuretic but as an aldosterone antagonist. Given the current pharmacokinetic data there is no benefit in either cats or dogs at using a higher dose rate as there is no increased therapeutic benefit just an increased risk of side-effects.

Emergency Thoracocentesis

- This can be done conscious (EMLA cream is often useful especially in cats, but it does take at least 20 minutes to work which may be too long to wait).
- Sedation / GA as necessary otherwise. In many cats a rapid GA using a large box enabling pre-oxygenation and then using sevoflourane is in the authors hands a safe, rapid and effective way to anaesthetise these patients.
- u/s guidance is advisable for best position biggest pocket of fluid (ICS 7-9 ventral third fluid, dorsal third air)
- Butterfly needle – cranial aspect of the rib to avoid laceration of the intercostal vessels
- Samples for analysis (cytology and culture) When draining a pleural effusion it is important identify the type of effusion.
- NB a pure haemothorax – does not need draining as the volume of blood required to be physically present to lead to dyspnoea would have led to death of the patient from blood loss.

Emergency therapy for respiratory patients

- Oxygen
- Sedation as necessary
- Check temperature!
- Fans
- Quiet environment
- Following emergency echo drain fluid / air as necessary
- Anti-biotics i/v if infection a concern
- Inhaled salbutamol
- Parenteral bronchodilator
- i/v dexamethasone – if necessary (but this can affect diagnostics)
- Thoracocentesis for fluid or air as necessary
- Cheat drains may need to be considered if significant amount of re-current pleural effusion or pneumothorax where a Heimlich valve may need to be used.

Cardiac Therapeutics

Heart failure is not only due to the physical effects of pump failure but also it should be considered as a hormonal disorder. The hormones released in CHF lead to a vicious circle which leads to further deterioration of the clinical signs. Without appropriate and rapid therapy clinical signs can rapidly spiral out of control. It is also likely that animals that are maintained in a steady state without 'crashes' and sudden deterioration are going to survive longer with a better quality of life. Many of the drugs commonly used in the treatment of heart failure are not licensed. It is important that owners are informed and consenting to the use of non-licensed treatment.

Furosemide

- Most important drug in congestive heart failure
- Loop diuretic
- 1st line diuretic
- Very potent
- Plasma half time is 15 minutes
- Peak effect orally is 1-2 hours
- Duration of action is 4-5 hours
- More potent given parentally especially if given iv

In dogs

- Acute severe CHF
- 2mg/kg and then 1mg/kg hourly until dyspnoea is under control (NB minimal dose as necessary therefore close monitoring is essential)
- Chronic therapy give at least twice daily and give the minimum required to control breathing rate.

In cats

- Acute severe dyspnoeic cats

2mg/kg i/v

1mg/kg hourly thereafter to control RR (NB close monitoring is essential)

1mg/kg every four hours weaning down to 8 hourly

- Care as cats will develop severe profound hypokalaemia

ACEI (Angiotension converting enzyme inhibitor)

ACEI lead to arteriodilation and venodilation which in turns lead to reduced afterload and preload. There is decreased salt and water retention due to reduced aldosterone production, which again leads to reduced pre-load. There is also a reduction in angiotensin II induced cardiac remodelling and fibrosis.

Licenced in dogs for the treatment of CHF in dog

- Large numbers of good clinical trials showing efficacy in dogs with CHF due to both CDVD and DCM.
- Venous and arterial vasodilation
- Decreased salt and water retention
- 0.25mg/kg – 0.5mg/kg which can be twice daily. However care must be taken to monitor BP and it is best to start at a lower dose and titrate upwards as necessary.

Not licenced in cats for the treatment of CHF

- Theoretical benefits and anecdotal evidence (though treat this with the appropriate scepticism) but in the authors hands it is an effective treatment and should be used in all cats with CHF unless their blood pressure is too low to tolerate it.
- ? LVOT obstruction
- Fox trial ACVIM 2004 showed benefit in a group of cats with CHF.
- Gaining popularity
- 0.25mg/kg – 0.5mg/kg q 24hr / q 12 hr

- Evidence still lacking

Will reduce BP so care in hypotensive patients

Monitor renal function carefully as some cats will not tolerate ACEI and it can potentially unmask subclinical renal disease. This is due to the reduction in intra-glomerular pressure and so in cats which are reliant on high intra-glomerular pressure to maintain GFR a rise in their renal parameters would be seen with ACEI. These changes can be transient or persistent. If there has been an increase in renal parameters, this should have resolved within 4 weeks, if the levels do not resolve then a reduction in dose or termination of the ACEI should be considered.

For these reasons the dose of ACEI should gradually be titrated upwards.

Pimobendan

Good EBM for the use in CHF in dogs with CDVD (Quest Trial, Smith trial, and now in asymptomatic dogs, protect study and Epic Study).

Inodilator

- Calcium-sensitizing drug
- Positive inotrope without increasing myocardial oxygen demand.
- PDE III inhibitors
- Vasodilation
- Antithrombotic activity
- 'Feel good' factor ? mechanism
- Extremely well tolerated
- The intra venous formulation works exceptionally well in the emergency situation and although not licensed in cats, the author has used it very successfully in cats as long as they don't have obstructive disease.

Spironolactone (EBM supportive of its use in CHF in mitral valve disease dogs)

Licensed In dogs with CHF:

- Aldosterone antagonist
- Potassium sparing effect
- Anti-fibrotic effect?
- 2mg/kg with food ONCE daily

- Veterinary licensed (Prilactone®)
- Acts on the collecting duct/DCT
- Potassium sparing effect
- Beneficial effects in CHF
- Improvements in cough, dyspnoea, syncope mobility

In cats:

- Not licensed, but the SEISICAT study suggests that spironolactone is beneficial in cats with CHF secondary to a cardiomyopathy.
- Adverse severe skin reaction noted in one study in the US but this was one colony of Maine Coon cats and they were given a high dose at 2mg/kg BID. No significant side effects were seen in the SEISICAT study.

Potassium Supplementation

- The importance of potassium supplementation cannot be over stated to ensure that animals do not become hypokalaemic.
- Hypokalaemia can lead to:
 - Weakness
 - Anorexia
 - Cardiac arrhythmias

Hypokalaemia can be very dangerous as owners of animals which are hypokalaemic who are weak and not eating well will consider these patients to have a poor quality of life and therefore likely to consider euthanasia.

- Tumil K – This is now very difficult to get due to manufacturing issues.
- Kaminox – This is excellent for cats as they like the taste leading to good compliance and it also contains B vitamins which can become deficient in animals who are polydipsic and have a poor appetite. However it can become very expensive in dogs.

Atenolol (selective beta-blocker)

- Heart rate control
- Anti-arrhythmic
- Reduce LVOFTO
- Decrease myocardial oxygen demand

- Selective Beta-1 agonist
- NOT to be used in heart failure
- Limited EBM shows increased mortality if used in CHF in cats.

Diltiazem (Hypercard®)

In cats

- Licensed product for the treatment of HCM
- Have positive lusitropic properties (but apart from the original very small trial in cats by Bright and al no one has been able to demonstrate a clinical benefit of this drug in cats apart from for rate control)
- May reduce LVH
- ? Benefit
- Recent study no effect on survival time in cats with severe HCM and HF

In dogs

- Use for rate control for supra-ventricular tachycardias
- Care with the use of ventricular arrhythmias
- Can have marked negative inotropic effects so care with use in animals with significant systolic dysfunction.
- Can lead to anorexia and reversible liver disease

Clopidogrel (Plavix®) – Not licensed in either dog or cat

- Inhibits platelet aggregation⁹
- FAT cat trial suggested good evidence for reducing the risk of thrombus development in cats
- Appears relatively safe

Mild neutropaenia in some cases

- Very bitter in taste
- 18.75mg / cat / day
- 3mg/kg per dog

Aspirin

- Inhibition of platelet aggregation
- No EBM to report efficacy
- Care

Gastric ulceration

GIT upsets

Renal compromise