Essential Clinical Guides Series

"Managing Canine Acute Congestive Heart Failure Under Covid-19 Restrictions"

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Identifying congestive heart failure (CHF)

- **Tachypnoea/dyspnoea and respiratory effort:**
    - **Pulmonary oedema**: the presence of pulmonary oedema leads to a mixed dyspnoea with tachypnoea where the proportion of time spent in inspiration and expiration remains roughly the same length; the increase in effort depends on the severity of the oedema.
    - **Pleural effusion**: pleural effusion leads to a marked inspiratory effort due to restriction of lung expansion; the presence of abdominal effort is often present with discordance between the chest and abdominal movements (the abdomen contracts during inspiration).
- **Evidence of heart disease:**
    - Does the patient have a known history of heart disease?
    - A heart murmur or gallop are suggestive of structural heart disease.
    - Cardiac arrhythmias are also suggestive of possible heart disease.
    - Elevated NT-proBNP levels in conjunction with a murmur or gallop rhythm is suggestive of congestive heart failure.

Important note: tachycardia is a physiological compensatory mechanism secondary to reduction in cardiac output and is to be expected with congestive heart failure. A normal or low heart rate suggests another cause for the respiratory difficulties, particularly if sinus arrhythmia is present. There are exceptions to this rule.

Considerations

- **Small breed middle aged-older dogs typically have mitral valve disease*.**
    - More resilient and able to maintain blood pressure at appropriate levels because systolic function is maintained.
    - Care with pre-existing azotaemia as it will be worsened by diuretic treatment. Avoid prolonged high dosages of diuretics – once pulmonary oedema has resolved, aim to wean diuretic dose to lowest effective dose in order to protect renal function.

- **Large breed dogs typically have primary myocardial disease (dilated cardiomyopathy) but some may also have chronic valvular degenerative disease.**
    - Large breed dogs with primary myocardial disease will have systolic dysfunction.
    - Large breed dogs with valve disease may also have systolic dysfunction.
    - Dogs with systolic dysfunction are more prone to developing systemic hypotension.
    - Dogs with myocardial disease are more prone to arrhythmias. The type of arrhythmia tends to vary with the breed of dog e.g. Dobermans and Boxers commonly develop ventricular tachycardia, and Irish wolfhounds commonly develop atrial fibrillation. See our separate arrhythmia guides for further information.
    - Care with pre-existing azotaemia as it will be worsened by diuretic treatment. Avoid prolonged high dosages of diuretics – once pulmonary oedema has resolved, aim to wean diuretic dose to lowest effective dose in order to protect renal function.

Treatment plan

Step 1: Cage rest and oxygen therapy.

Stress has a very negative effect on patients in congestive heart failure. As soon as the patient arrives and CHF is suspected, placing them in a quiet and calm environment is the best course of action. If possible, include oxygen supplementation. An oxygen cage is the best option if available as it does not cause stress. Flow-by oxygen is also acceptable but often not practical and the presence of an unfamiliar person administering the oxygen may also cause stress. Nasal prongs may be used if tolerated but many times these do not fit the patient well due to nasal conformation and are not comfortable, so use is limited.

Step 2: Furosemide 2-4 mg/kg IV or IM.

It is acceptable to give the first dose intramuscularly (IM) to avoid the stress of placing an intravenous (IV) catheter. IV administration can then be continued once a catheter is in place.

Step 3: Consider sedation if necessary (Butorphanol 0.2 – 0.3 mg/kg injectable).

As mentioned before, stress has a negative effect on patients in CHF as circulating adrenaline will further increase heart rate and respiratory rate and put additional stress on the compromised cardiovascular system. If the patient still seems stressed in the cage do not be afraid to use sedation. Butorphanol is very safe in cardiac cases and is often enough to provide sufficient reduction in the levels of anxiety and stress.

Step 4: IV access and blood analyses.

As soon as possible an IV catheter should be placed and some blood should be taken. Placing lidocaine cream on the skin prior to IV catheter placement helps reduce the stress involved. Ideally perform full haematology and biochemistry, but if only a small amount of blood is obtained, prioritise PCV, total protein, UREA, CREA, electrolytes. It is imperative to assess kidney function and electrolytes when using diuretic treatment.

Step 5: Consider IV Pimobendan.

If available, intravenous pimobendan (0.15 mg/kg) may be given once IV access becomes available. This is particularly useful in cases where systolic dysfunction is present. If the patient is sufficiently stable, oral pimobendan (0.25-0.3 mg/kg) may be used instead of IV administration, as long as oral administration does not cause additional stress (a small treat or pill-pocket may be used).

Step 6: Additional diagnostic tests.

Once the patient is sufficiently stable, an effort should be made to confirm the diagnostic suspicion of CHF. A brief echocardiographic examination should ideally be performed to confirm the presence of significant heart disease. At the same time, the chest may be scanned to look for signs of pulmonary oedema (B-lines in the lungs) or pleural effusion. Alternatively, thoracic radiographs may be performed although they often require heavier sedation and cause more stress in comparison to ultrasound. A TFAST or brief cardiac ultrasound can be performed with the patient in sternal recumbency. Radiographs require the patient to lie in lateral recumbency which can be stressful and compromise respiration.

Step 7: Decide ongoing treatment.

- **Furosemide:**
  - 2 mg/kg q1-2 hours initially for first 4-6 hours or until RR starts lowering
    - 0.66-1 mg/kg/h CRI can be given if the patient is not responding to furosemide boluses
  - then 2 mg/kg q4-6h titrating down to 2 mg/kg TID
- Continue **pimobendan** (0.25 – 0.3 mg/kg PO BID)

How do I prepare a furosemide continuous rate infusion?

A furosemide CRI is useful for patients who are not responding adequately to furosemide boluses.

A continuous rate infusion requires access to an infusion pump or ideally a syringe driver to avoid administering the wrong amount of drug.

- **Syringe driver:** with a syringe driver, undiluted furosemide may often be used for the CRI:

  Example: I want to administer 1 mg/kg/h in a 10 kg dog, hence 10 mg/h. I fill a syringe (5-10 mL) with undiluted furosemide 5% (50 mg/mL) and administer 0.2 mL/h (10mg/50mg in 1 mL). Alternatively, furosemide can be diluted 1:1 with injectable water (i.e. 2.5 mL of furosemide 5% + 2.5 mL of injectable water) and administered at 0.4 mL/h.

- **Infusion pump:** with an infusion pump, an infusion needs to be prepared. Furosemide is added to a 100 mL saline bag or injectable water if available. Add 10 mL of furosemide 5% to 100 mL of saline creating an infusion with approximately 0.5% concentration (5 mg/mL). Calculate the amount of mg you want to give in 1 hour and divide by 5 to calculate how many mL should be given per hour.

Monitoring

- **Respiratory rate (q1-2 hours)**
- **Heart rate (q2-4 hours) or continuous ECG.**
- **Urine production**
- **Blood pressure (q4-12 hours)**
- **Repeat blood analyses in 24 hours**
- **Temperature (especially for patients in oxygen tent or oxygen cage as they can overheat)**

If a cardiac rhythm abnormality is identified, please refer to the appropriate guide on management of arrhythmias and do not hesitate to contact us for advice on diagnosis and treatment.

Patient care

- **Urine:** most patients need to urinate 30-60 minutes after injectable furosemide and will hold it unless taken out. This is a cause of stress and it is not unusual for the breathing rate to remain elevated simply due to this. MAKE SURE THE PATIENT URINATES. Small dogs can be carried outside to urinate rather than walked to prevent stress or exertion.
- **Water**: Make sure water is always available
- **Food:** food may be offered as soon as the patient is stable enough
- **Keep the patient in a calm and quiet environment.**

Treatment at home

In some cases with **mild signs** of CHF, **treatment at home** may be appropriate.

- **Furosemide** 2 mg/kg PO TID for 2-5 days (lowering to BID based on improvement of the breathing rate during sleep; owner should count sleeping breathing rate at least 2-3 times per day)
- **Pimobendan** 0.25-0.3 mg/kg PO BID (given 1 hour before food)
- **ACE inhibitor** (benazepril 0.25 mg/kg PO SID)
- **Spironolactone** (2 mg/kg PO SID or BID)

Once CHF has resolved, the following **chronic treatment** is appropriate for most cases.

- **Furosemide** 1-2 mg/kg PO BID (once breathing rate is normal or radiographs confirm resolution of CHF)

- Torasemide 0.1-0.6 mg/kg SID may be used instead of furosemide. Most dogs are stable at a dosage of 0.3 mg/kg SID or less
- **Pimobendan** 0.25-0.3 mg/kg PO BID (1 hour before food)
- **ACE inhibitor** (e.g. benazepril 0.25-0.5 mg/kg PO SID)
- **Spironolactone** (2 mg/kg PO SID)

Make sure you ask the client to **monitor the sleeping respiratory rate daily**. Values consistently above 30-35 breaths/min suggest that pulmonary oedema may still be present.

Maintain **adequate calorie intake** (approximately 60 kcal/kg BW) to minimize weight loss that often occurs in patients being managed for chronic CHF.

For **relapsing cases** already on the medication above, treatment is more challenging and needs to be tailored to each patient.

- **Furosemide** dosage may be increased to a maximum of 4 mg/kg PO TID or torasemide may be used instead at dosages up to 0.6 mg/kg daily (please note that in some cases BID administration may be preferable, not exceeding 0.6 mg/kg total daily dosage)

  Please do not hesitate to contact our team for advice on treating a patient with refractory congestive heart failure.

Repeat examination

- **5-10 days after discharge**: physical exam, blood analyses (PCV/TP, UREA, CREA, electrolytes), and blood pressure. Radiographs if breathing rate still abnormal.
- If staffing levels or staff safety cannot be maintained to enable appropriate levels of care for the patient, then it may be necessary to consider alternative options.

- Animal welfare should be a priority, but so should human safety in these challenging and unprecedented times. Look after yourself and your team, as well as your patient.

These guidelines were prepared in line with the current recommendations of the ACVIM consensus guidelines for the diagnosis and treatment of myxomatous mitral valve disease in dogs. These are available for open access consultation on the Journal of Veterinary Internal Medicine, Volume 33, Issue 3, May/June 2019.

* We refer to 'Mitral valve disease' in this document. Please note some dogs may also have tricuspid valve involvement. This common canine cardiac disease is also known as chronic valvular degenerative disease.

If you would like to speak to a VVS Specialist about any of your cases, please do not hesitate to contact us:

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VVS Specialists are here to help and can review clinical history and test results and advise you on your cases as and when you need support.

You may be working sole charge, but you are not alone.