Treatment of Feline Hypertrophic Cardiomyopathy - Lost Dreams

World Small Animal Veterinary Association World Congress Proceedings, 2014
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Treatment of Cats With No Clinical Signs (Nothing Works)

There currently is no evidence that any drug alters the natural history of HCM in cats until they are in heart failure. Diltiazem, atenolol, and ACE inhibitors are commonly administered to cats with mild to severe HCM that are not in heart failure on an empirical basis. Studies by the author have shown that ramipril, an ACE inhibitor, and spironolactone have no beneficial effects on HCM prior to the onset of heart failure (do not work),[1] resulting in left ventricular (LV(2)"container-title":"J Vet Intern Med,""page":"335-41,""volume":"22,""archive_
cation":"18346145,""abstract":"BACKGROUND: Myocardial fibrosis occurs in cats with hypertrophic cardiomyopathy (HCM In addition, spironolactone produced severe skin lesions in some cats. Atenolol does not decrease circulating NT-proBNP or troponin in cats with HCM prior to the onset of heart failure.[3] In a recent study, atenolol also did not prolong survival in cats with preclinical HCM when compared to cats that were not on atenolol.[4]

Treatment of Cats in Heart Failure Due to HCM (Some Things Work)

Cats that present in heart failure primarily have clinical signs referable to pulmonary edema and/or pleural effusion. Consequently, therapy is generally aimed at decreasing left atrial and pulmonary venous pressures in these cats and physically removing the effusion. In some cats with severe heart failure, clinical evidence of hypoperfusion (low-output heart failure) may also be apparent. The signs may be manifested primarily as cold extremities. Pulmonary edema is primarily treated with diuretics (almost exclusively with furosemide) acutely and chronically and an ACE enzyme inhibitor chronically, although recent evidence suggests that ACE inhibition may not be that helpful in prolonging survival in cats with HCM. Diltiazem and beta adrenergic blockers, usually atenolol, have been commonly used as adjunctive agents. Recent evidence suggests that diltiazem is not helpful in prolonging survival in cats with heart failure due to severe HCM and that atenolol may actually shorten survival time. Pleurocentesis is most effective for treating cats with severe pleural effusion. However, furosemide is often helpful at slowing effusion re-accumulation.

Acute Therapy

Cats that present with respiratory distress suspected of having heart failure secondary to HCM need to be placed in an oxygen enriched environment. If possible, the cat should be initially evaluated by doing a cursory physical examination, taking care not to stress the patient during this or any other procedure, since stress exacerbates dyspnea and arrhythmias and often leads to death. Most, but not all, cats with severe HCM that are in heart failure will have a heart murmur, and many will have a gallop sound (gallop rhythm). A butterfly catheter should be used to perform thoracentesis on both sides of the chest to look for pleural effusion as soon as possible. Generally, this should be done with the cat in a sternal position so that it does not become stressed during the procedure. Clipping of the hair is not

needed. If fluid is identified, it should be removed. If none is identified, a lateral thoracic radiograph to identify pulmonary edema may be taken with the veterinarian present to ensure that the cat is not stressed.

Furosemide (Works)

Furosemide should initially be administered IV or IM to the cat in severe respiratory distress. Cats that can tolerate an intravenous injection may benefit from the more rapid onset of action (within 5 minutes of an IV injection vs. 30 minutes for an IM injection). The initial furosemide dose to a cat in distress should generally be in the 2 to 4 mg/kg range IM or IV. This dose may be repeated within 1 hour to 2 h. Dosing must be reduced sharply once the respiratory rate starts to decrease to avoid severe dehydration.

High-dose parenteral furosemide therapy commonly produces electrolyte disturbances and dehydration in cats. Cats with severe heart failure that require intensive therapy are often precarious. They may be presented dehydrated and electrolyte-depleted because of anorexia. They may remain anorexic, and consequently dehydrated and depleted of electrolytes once the edema and/or the effusion are lessened. Judicious intravenous or subcutaneous fluid administration may be required to improve these cats clinically. Overzealous fluid administration will result in the return of CHF. If fluid administration is required, the furosemide administration must be discontinued for that time.

Nitroglycerin (Probably Does Not Work)

Nitroglycerin cream may be beneficial in cats with severe edema formation secondary to feline cardiomyopathy. However, no studies have examined any effects of this drug in this species and its efficacy is suspect. Nitroglycerin is certainly safe and some benefit may occur with its administration in some cats. Consequently, 1/8" to 1/4" of a 2% cream may be administered to the inside of an ear every 4 to 6 h for the first 24 h as long as furosemide is being administered concomitantly. One should never rely on nitroglycerin to produce a beneficial effect. Nitroglycerin tolerance develops rapidly in other species and probably does so in the cat. Consequently, prolonged administration is probably of even lesser benefit.

Once drug administration is complete, the cat should be left to rest quietly in an oxygen enriched environment. Care should be taken not to distress the cat. A baseline measurement of the respiratory rate and assessment of respiratory character should be taken when the cat is resting. This should be followed at 30-minute intervals and furosemide administration continued until the respiratory rate starts to decrease (a consistent decrease of the respiratory rate from 70 to 90 breaths/minute into the 50 to 60 breaths/minute range is a general guide) and/or the character of the cat's respiratory effort improves. When this occurs, the furosemide dose and dosage frequency should be curtailed sharply.

Sedation or Anesthesia

In some cats, sedation with acepromazine (0.04 to 0.1 mg/kg subQ) may help by producing anxiolysis. Oxymorphone (0.04 to 0.1 mg/kg q6h IM, IV, or subQ) or butorphanol tartrate (0.08 mg/kg IV or 0.36 mg/kg q4h subQ) may be used but are secondary choices, because they can produce respiratory depression.

In some cats with fulminant heart failure, anesthesia, intubation, and ventilation are required to control the respiratory failure. This can be lifesaving in some cats.

Chronic Therapy

Many aspects of chronic therapy of HCM are controversial. All therapy is palliative and ultimately futile in most cases. Furosemide is the only drug that has a clearly beneficial effect chronically on survival in cats with HCM.

Pleurocentesis (Works)

Many cats with HCM are dyspneic because of pleural effusion that reaccumulates despite appropriate medical therapy. These cats need periodic pleurocentesis as outlined above in the section on DCM.

Furosemide (Works)

In cats with CHF due to HCM, furosemide administration, once initiated, should usually be maintained for the rest of the cat's life. In a few cases, furosemide can be discontinued gradually once the cat has been stabilized. This usually only occurs in a cat that has had a precipitating stressful event.

As for DCM, the maintenance dose of furosemide in cats usually ranges from 6.25 once a day to 12.5 mg PO q8h, although the dose may be increased further if the cat is not responding to a conventional dose. We have administered higher doses (up to 37.5 mg q12h) than commonly recommended to a few cats with severe heart failure without identifying severe consequences, as long as the cats were eating and drinking. Cats on high-dose furosemide therapy are commonly mildly dehydrated and mildly to moderately azotemic. However, they often continue to maintain a reasonable quality of life.

The furosemide dose needs to be titrated carefully in each patient. The owner should be taught how to count the resting respiratory rate at home and instructed to keep a daily written log of the respiratory rate as outlined above under DCM. This is highly beneficial for making decisions regarding dosage adjustment in individual patients.

ACE Inhibitors (May Be of Some Benefit)

The use of ACE inhibitors in cats with HCM is relatively recent because veterinarians shared the fears of their human medical counterparts that they might worsen SAM. Over the past 10 years, it has become obvious to veterinary cardiologists that ACE inhibitors do not worsen the clinical signs referable to HCM. Many have believed and one study has suggested that ACE inhibitors improve the quality and quantity of life of cats with HCM. Evidence from an unpublished placebo-controlled and blinded clinical trial suggests that enalapril produces little to no benefit when compared to furosemide alone in cats with heart failure due to HCM. However, this study also included cats with unclassified (restrictive) cardiomyopathy and both cats with and without SAM. Subgroup analysis failed to change the conclusions of the study but the subgroups were small. Consequently, this author recommends we continue to use an ACE inhibitor in cats in heart failure due to HCM at a dose of 1.25 to 2.5 mg PO q24h.

Diltiazem (Questionable Efficacy)

In cats with severe HCM that have or have had evidence of CHF, diltiazem or a beta adrenergic blocking agent are often administered. Both provide symptomatic benefit in human patients. Their utility in cats with HCM is controversial, although there is little doubt that neither drug produces dramatic benefits. Diltiazem, however, appears to produce no harm. Diltiazem is a calcium channel blocker previously reported to produce beneficial effects in cats with HCM when dosed at 7.5 mg q8h.[5] Beneficial effects that have been reported include lessened edema formation and

decreased wall thickness in some cats. In the author's experience, only a few cats appear to experience a clinically significant decrease in wall thickness, and it is impossible to tell if this is due to drug effect or time. Rarely does it appear clinically that diltiazem controls CHF on its own or helps control pulmonary edema or pleural effusion when added on to furosemide therapy. Diltiazem does improve the early diastolic relaxation abnormalities seen in feline HCM. Whether this helps decrease diastolic intraventricular pressure and so decrease edema formation is unknown. Theoretically it should have little benefit in the resting cat with a slow heart rate. Slower myocardial relaxation during rapid heart rates may not allow the myocardium enough time to relax, resulting in increased diastolic intraventricular pressure. Consequently, diltiazem may help protect a cat that undergoes a stressful event. Incomplete relaxation and decreased compliance, however, are more plausible explanations for increased diastolic pressure due to diastolic dysfunction in feline HCM. In humans, diltiazem does not change left ventricular chamber stiffness and so does not alter passive diastolic function. Diltiazem decreases SAM, but beta blockers generally produce a greater decrease in the amount of SAM. Recent evidence suggests that diltiazem has no effect on survival time in cats with severe HCM and heart failure. Consequently, there currently appears to be no ethical mandate for its use in cats with heart failure due to HCM and it would appear that many veterinary cardiologists have abandoned its use.

In addition to its regular formulation (30-mg tablets in the USA), diltiazem is supplied as slow-release (long-acting) products. Cardizem CD is supplied as 180-mg capsules that contain hundreds of small capsules. The larger capsule can be opened and a number of the smaller capsules divided into groups of four (45 mg each) and placed in smaller gelatin capsules for administration. One capsule is then administered q24h. Dilacor XR capsules can be opened to yield 2, 3, or 4 60-mg tablets. This drug is dosed at 30 mg per cat PO q12h and produces a significant decrease in heart rate and blood pressure in cats with HCM for 12 to 14 h.

Beta-Adrenergic Receptor Blockers (Work to Reduce SAM)

Beta blockers are primarily used to reduce SAM and heart rate in cats with HCM. However, at this stage beta blockers should probably be reserved for cats with severe SAM at rest or with tachyarrhythmias and not routinely administered to the affected population as a whole, since a recent study has suggested that atenolol shortens the survival of cats with diastolic dysfunction, including cats with HCM. Beta blockade is questionable for SAM and tachycardia observed in a clinical situation anyway. Cats spend 85% of their life asleep, and sleep probably reduces sympathetic activity better than a beta-adrenergic blocking drug. Consequently, many cats with mild to moderate SAM in a veterinary clinic probably have no or milder SAM at home and the same can be said for tachycardia. Beta blockers are effective for reducing SAM. Two unpublished studies have examined the effects of esmolol, a short-acting β_1-adrenergic blocking drug, in cats with HCM and obstruction to left ventricular outflow due to SAM and shown a reduction in the pressure gradient across the outflow tract. In both studies, the degree of outflow tract obstruction decreased and the heart rate slowed and in one esmolol was more effective than diltiazem.

Atenolol is a specific β_1-adrenergic blocking drug that needs to be administered twice a day, usually at a total dose of 6.25 to 12.5 mg PO q12h.[6] "container-title":"Am J Vet Res,""page":"1050-3,""volume":"57,""source":"NLM,""archive_ location":"8807020,""abstract":"OBJECTIVES: To determine the pharmacokinetics of atenolol (AT

In cats, atenolol has a half-life of 3.5 h. When administered to cats at a dose of 3 mg/kg, atenolol attenuates the increase in heart rate produced by isoproterenol for 12, but not for 24, h.

Pimobendan

In theory, pimobendan, due its potent positive inotropic effects in other species, should be contraindicated in cats with HCM. One retrospective study, however, used pimobendan in 68 cats with HCM and recorded no untoward effects.[7] However, in another study, pimobendan to a cat with systolic anterior motion of the mitral valve resulted in hypotension.[8]

A survey of veterinary cardiologists/residents regarding their use of pimobendan in cats with cardiomyopathy was recently performed by the author. Results show:

1. Most do not use PB in cats with HCM unless they have myocardial dysfunction or are refractory to conventional heart failure therapy.
2. In cats with HCM refractory to conventional heart failure therapy, around 50% use it only if SAM is not present and 50% use it regardless of whether it's present or not.
3. Almost all use pimobendan in cats with HCM and myocardial failure, DCM, and UCM/RCM when the cat is in heart failure.
4. In cats with HCM, around 50 to 60% think more than 50% of cats have a clinical response to pimobendan.
5. (VIN editor: Step 5 was missing from the original text.)
6. Approximately half had the impression that cats with HCM and DCM lived longer. Only around one-third thought cats with UCM/RCM lived longer.
7. Most use a dose of 0.25 to 0.3 mg/kg BID.

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