Treatment of myxomatous mitral valve disease in dogs

A selection of references from a search in CAB Abstracts database

<1>
Accession Number
20163336568
Author
Pirintr, P.; Saengklub, N.; Limprasutr, V.; Sawangkoon, S.; Buranakarl, C.; Kijtawornrat, A.
Title
Effects of long-term treatment with sildenafil on spectral analysis of heart rate variability in asymptomatic dogs with mitral valve regurgitation.
Source
Publisher
World Small Animal Veterinary Association
Location of Publisher
Bangkok
Country of Publication
Thailand
Publication Type
Conference paper.

<2>
Accession Number
20163315929
Author
Apple, S. M.; Menciotti, G.; Braz-Ruivo, L.; Crosara, S.; Haggstrom, J.; Borgarelli, M.
Title
Effects of pimobendan on myocardial perfusion and pulmonary transit time in dogs with myxomatous mitral valve disease: a pilot study.
Source
Australian Veterinary Journal; 2016. 94(9):324-328. 29 ref.
Publisher
Wiley-Blackwell
Location of Publisher
Melbourne
Country of Publication
Australia
Abstract
Objectives: To describe pulmonary transit time (nPTT) and myocardial perfusion (nMP) normalised to heart rate in dogs with stable ACVIM stage C myxomatous mitral valve disease (MMVD) and to assess short-term effects of pimobendan on these variables. We hypothesised that nPTT and nMP would increase in dogs with MMVD compared with normal dogs. Additionally, we hypothesised that treatment with pimobendan would decrease nMP and nPTT in dogs with MMVD. Design: Prospective, single-blind study involving 6 normal dogs and 12 dogs with MMVD. Methods: Dogs with MMVD were treated with enalapril and furosemide for at least 1 month prior to examination. All dogs underwent standard and contrast echocardiographic
examinations at the beginning of the study (T0). At this time, MMVD dogs were randomly assigned to receive either pimobendan (0.4-0.6 mg/kg) or not. All dogs with MMVD were re-evaluated by standard and contrast echocardiography after 1 week (T1) and nPTT and nMP were measured. Results: nPTT was significantly increased in dogs with MMVD (P=0.0063), compared with normal dogs. It was significantly decreased at T1 in dogs receiving pimobendan (P=0.0250). The nMP was not significantly different in dogs with MMVD, compared with healthy dogs (P=0.2552), and it was not significantly different at T1 in the treatment group (P=0.8798). Conclusions: Contrast echocardiography was a valid, complementary tool for echocardiographic analysis of dogs with MMVD. Pimobendan decreased nPTT in dogs affected by MMVD. Myocardial perfusion was not different in dogs with severe MMVD.

Publication Type
Journal article.

<3>
Accession Number
20163273405
Author
Lefbom, B. K.; Peckens, N. K.
Title
Impact of collaborative care on survival time for dogs with congestive heart failure and revenue for attending primary care veterinarians.
Source
Journal of the American Veterinary Medical Association; 2016. 249(1):72-76. 34 ref.
Publisher
American Veterinary Medical Association
Location of Publisher
Schaumburg
Country of Publication
USA
Abstract
OBJECTIVE: To assess the effects of in-person collaborative care by primary care veterinarians (pcDVMs) and board-certified veterinary cardiologists (BCVCs) on survival time of dogs after onset of congestive heart failure (CHF) and on associated revenue for the attending pcDVMs. DESIGN: Retrospective cohort study. ANIMALS: 26 small-breed dogs treated for naturally occurring CHF secondary to myxomatous mitral valve disease at a multilocation primary care veterinary hospital between 2008 and 2013. PROCEDURES: Electronic medical records were reviewed to identify dogs with confirmed CHF secondary to myxomatous mitral valve disease and collect information on patient care, survival time, and pcDVM revenue. Data were compared between dogs that received collaborative care from the pcDVM and a BCVC and dogs that received care from the pcDVM alone. RESULTS: Dogs that received collaborative care had a longer median survival time (254 days) than did dogs that received care from the pcDVM alone (146 days). A significant positive correlation was identified between pcDVM revenue and survival time for dogs that received collaborative care (ie, the longer the dog survived, the greater the pcDVM revenue generated from caring for that patient). CONCLUSIONS AND CLINICAL RELEVANCE: Findings suggested that collaborative care provided to small-breed dogs with CHF by a BCVC and pcDVM could result in survival benefits for affected dogs and increased revenue for pcDVMs, compared with care provided by a pcDVM alone.
Publication Type
Journal article.

<4>
Accession Number
20163271523
Author
Surachetpong, S. D.; Boonlue, N.; Pupa, P.; Boonsathitanan, W.; Rakthaidee, S.; Mangklabruks, T.; Sakarin, S.

Title
Electrocardiographic changes in dogs with degenerative mitral valve disease treated with pimobendan: a retrospective study of 29 cases.

Source
Thai Journal of Veterinary Medicine; 2016. 46(2):243-249. 27 ref.

Publisher
Faculty of Veterinary Science, Chulalongkorn University

Location of Publisher
Bangkok

Country of Publication
Thailand

Abstract
The aim of this retrospective study was to evaluate changes in electrocardiograms (ECG) and cardiac arrhythmias in 29 dogs with degenerative mitral valve disease (DMVD) treated with pimobendan chronically. All dogs had normal ECG before pimobendan administration. The dogs were classified according to ECG after pimobendan administration into 2 groups: normal ECG (n=19) and abnormal ECG (n=10). Age, sex, breed, serum alkaline phosphatase, concurrent digoxin administration, total daily dosage of pimobendan and digoxin, duration of pimobendan administration, and ECG parameters including heart rate, P wave, PR interval, QRS complex, and QT interval were analyzed. Cardiac arrhythmias were increasingly found in the dogs treated with pimobendan in combination with digoxin. The total daily dosage of pimobendan and digoxin in the dogs with abnormal ECG was higher than in those with normal ECG (p=0.022, 0.038, respectively). In conclusion, cardiac arrhythmias can be found in dogs chronically treated with pimobendan. Therefore, caution should be taken when using pimobendan at a high dosage or in combination with digoxin.

Publication Type
Journal article.

Accession Number
20163087064

Author
Jung, S. W.; Sun, W.; Griffiths, L. G.; Kittleson, M. D.

Title
Atrial fibrillation as a prognostic indicator in medium to large-sized dogs with myxomatous mitral valvular degeneration and congestive heart failure.

Source

Publisher
Wiley-Blackwell

Location of Publisher
Boston

Country of Publication
USA

Abstract
Background: The prevalence and prognostic importance of atrial fibrillation (AF) on survival in nonsmall breed dogs with myxomatous mitral valvular disease (MMVD) and congestive heart failure (CHF) remain unknown. Aim: To identify the prevalence of AF in nonsmall breed dogs with CHF because of MMVD and to characterize the impact of AF on survival outcome. Animal: Sixty-four client-owned dogs (>15 kg) with MMVD and CHF. Methods: Retrospective review of medical records for dogs weighing >15 kg with MMVD treated for CHF. Results: Thirty-three dogs presented with AF or developed AF during follow-up examinations, and 31 dogs were free of AF until cardiac-related death. For dogs with AF, median survival time (MST) was 142 days (range: 9-478) while dogs without AF lived 234 days (range: 13-879 days). AF increased risk of cardiac-related death (HR=2.544; 95% CI=1.41-4.59; P=.0019) when compared to dogs...
without AF. MST was significantly prolonged for dogs with AF whose rates were adequately controlled (<160 bpm; 171 days; n=13) when compared to dogs that failed to respond to negative chronotropic agents (61 days; n=20; P=.032). The administration of combination treatment (diltiazem and digoxin) significantly decreased median HR to 144 bpm (range: 84-218 bpm) in dogs with AF and significantly prolonged MST (diltiazem+digoxin: 130 days versus diltiazem: 35 days, P=.0241) when compared to diltiazem alone.

Conclusions and Clinical Importance: Inadequately controlled AF is associated with a higher rate of mortality. Optimization of therapeutic strategies for the rate control of AF remains determined.

Publication Type
Journal article.

<6>
Accession Number
20153420885
Author
Harris, J.
Title
Advanced degenerative mitral valve disease and congestive heart failure in dogs.
Source
Publisher
MA Healthcare Limited
Location of Publisher
London
Country of Publication
UK
Abstract
Degenerative mitral valve disease (DMVD) is the most common cardiovascular disease in dogs and is a major cause of congestive heart failure (CHF) in this species. This article reviews the pathophysiology and natural history of the disease and provides a summary of current recommendations for diagnosis and treatment of dogs with advanced DMVD and CHF.

Publication Type
Journal article.

<7>
Accession Number
20153347777
Author
Patteson, M.
Title
Heart disease: managing the individual patient.
Source
Publisher
Veterinary Business Development Ltd
Location of Publisher
Peterborough
Country of Publication
UK
Publication Type
Journal article.
Assessment of the therapeutically efficiency of benazepril-furosemide bimedication from a clinical and echocardiographic point of view in dogs with mitral valve endocardiosis.

**Source**

**Publisher**
Facultatea de Medicina Veterinara

**Location of Publisher**
Timisoara

**Country of Publication**
Romania

**Abstract**
Mitral valve endocardiosis or mitral valve disease is the most common cause of heart failure in geriatric dogs. Based on the physiopathology of the decompenasated faze in heart failure the target of the medical treatment is to block the renin-angiotensin aldosterone system. The most used angiotensin converting enzyme inhibitor used in veterinary medicine is benazepril. The aim of this study is to evaluate the efficiency on quality of life and echocardiographic parameters of the combination benazepril and furosemide. Twenty one dogs diagnosed with mitral valve disease in stages C and D of the disease were included in the study. Dogs underwent clinical cardiology examination, echocardiography and electrocardiography in three points: T0 first consultations, T1 after 15 day of treatment and T2 after 65 days of treatment. All data were included in data bases. The statistical analyses were made in IBM SPSS vs.21 software. All clinical sings followed in the study were significantly improved after 15 day of treatment except cavity effusions, which were cleared after 65 days. No significant differences was observed in echocardiographic parameters of cardiac remodeling during the treatment. No increase in left atrium or in left ventricle was noticed after 65 day of treatment. The combination of benazepril-furosemide proved to benefit significantly in the clinical status of all patients with naturally occurring mitral valve disease in short period of time and also slowed the evolution of the disease.

**Publication Type**
Journal article.
Myxomatous mitral valve disease (MMVD) is the most common heart disease of dogs. The current management of MMVD in dogs is mostly pharmacological, and the recommendations for treatment are based on a number of veterinary studies. Notwithstanding the current consensus regarding the medical management of MMVD, there remains active debate as to which drugs are the most effective. In order to understand how recommendations are constructed in the pharmacological management of diseases, the veterinarian needs to understand the concept of evidence-based veterinary medicine, and how the findings of these studies can be applied in their own practices. This review summarises the current veterinary literature and explains how the consensus regarding the management of MMVD has been reached. This review highlights the limitations of veterinary studies in order to provide veterinary practitioners with a sense of the difficulty there is in establishing the benefit of one treatment over the other. Veterinarians should therefore apply treatment recommendations based on the best evidence, integrated with a pathomechanistic understanding of the disease process and clinical experience.

Publication Type
Journal article.
The myxomatous mitral valve degeneration (DMVM) is the most common heart disease in dogs. The treatment of congestive heart failure (CHF) from DMVM is based on the use of angiotensin-converting enzyme inhibitors (ACE inhibitor) Receptor antagonists of angiotensin II (ARBs) promote complete blockade of angiotensin II, and are used in the treatment of CHF in humans, but is not common in dogs. The objective of this research was to compare the clinical responses of dogs carriers DMVM treated with enalapril-ACE inhibitors, losartan-ARBs. Thirteen dogs with DMVM and ICC class Ib were randomized into two groups as follows: G1-enalapril and G2-losartan. On physical examination, electrocardiogram and blood pressure were measured on days 0, 14, 28 and 56 after the begging of treatment. Radiographic measure, Vertebral Heart Size-VHS and ecodopplercardiograficas variables were obtained on days 0 and 56. Data were subjected to analysis of variance with repeated measures. There was no difference (P>0.05) for ecodopplercardiograficas, electrocardiographic and radiographic variables between the groups studied. In relation to time, there was a decrease (P<0.05) of the VHS, duration of the P wave and the QRS complex variables. We conclude that losartan acts similarly to enalapril in the initial treatment (first 56 days) of dogs with DMVM class Ib and II of the CHF.

Kim, J. H.; Park, H. M.
Usefulness of conventional and tissue Doppler echocardiography to predict congestive heart failure in dogs with myxomatous mitral valve disease.
Wiley-Blackwell
Boston
USA
Background: Systolic and diastolic functions have been evaluated to predict outcome in congestive heart failure (CHF). Recently, tissue Doppler imaging (TDI) has become useful for the estimation of myocardial function in cardiac diseases of humans and animals. Objective: This study was designed to assess whether myocardial function as assessed by TDI is associated with the occurrence of CHF in dogs with myxomatous mitral valve disease (MMVD) and whether additional information is gained over conventional Doppler variables. Animals: Forty-one privately owned dogs (15 healthy dogs and 26 dogs with MMVD) were included. Dogs with MMVD were divided into non-CHF (n=10) and CHF groups (n=16). Methods: Conventional echocardiographic examinations were performed. In addition, TDI-derived variables, including radial and longitudinal velocities, strain, and strain rate were assessed. Results: Several (12 of 47, 26%) conventional and tissue Doppler echocardiography variables were significant predictors of CHF in a univariate analysis (P<.05). However, TDI-derived E/Em sept was the only load-independent significant predictor of CHF (P<.05) after multivariate logistic regression analysis. The E/Em sept cut-off value of >18.7 had a sensitivity of 56% and specificity of 90% in predicting CHF in dogs with MMVD. Conclusions and Clinical Importance: The combination of TDI of the mitral annulus and mitral inflow velocity provided better estimates of diastolic dysfunction in dogs with MMVD and CHF. Additional study is warranted to assess TDI-derived E/Em sept, an index of diastolic function that could contribute to the management of dogs with MMVD and CHF.
Myxomatous mitral valve disease (MMVD) and dilated cardiomyopathy (DCM) in dogs, and different forms of cardiomyopathy in cats, may lead to signs of congestive heart failure (CHF). Traditionally, signs of CHF have been treated with a diuretic together with other adjunct therapy, such as digoxin, but very little data from clinical trials was available to support treatment strategies. During the last 20 years, an important paradigm shift has occurred in the demand for data to support our clinical decisions in dogs and cats with heart disease. Today, several drugs have in clinical trials been shown to improve outcome in small animal CHF patients, as indicated by improved quality of life and increased survival time. Not only have the growing number of drug trials provided information on drug efficacy, but these trials have also provided important information on prognostic value of clinical tests and a deeper understanding of disease progression. This article reviews current treatment alternatives from asymptomatic to progressed stages, associated with severe clinical signs of CHF, in dogs with MMVD or DCM and in cats with cardiomyopathy.

Pimobendan improves clinical signs in short term compared to digoxin or placebo in dogs with heart failure due to chronic degenerative mitral valve disease.


Acta Scientiae Veterinariae; 2014. 42:1175. 22 ref.
Abstract

The purpose of this study is to evaluate the clinical response and QoLQ in heart failure (HF) dogs treated with digoxin or pimobendan in addition to conventional therapy (furosemide and benazepril). Dogs in class III or stabilized class IV (NYHA) were used in this study. Exclusion criteria: use of positive inotrope and antiarrhythmic, presence of atrial fibrillation, renal or hepatic disease or neoplasia. 33 dogs were included and randomly assigned to DIG (n=11), PIMO (n=14) and placebo (PL) (n=8) and followed up weekly. Data was evaluated for days zero, 7, 14 and 28. Increasing score was assigned to each variable depending on worsening of clinical evaluation history and physical exam, QoLQ and echocardiogram (echo). Three dogs died during treatment due to worsening of HF, one of PL group and two of DIG group; furthermore, one of PIMO group was censored due to worsening of heart failure. There was no significant difference between and within groups for echo and radiography. PL and DIG groups did not show any significant difference throughout the 28 days of treatment. PIMO group showed lower physical exam score and increased early mitral inflow velocity on day 28. Serum creatinine increased on days 14 and 28 compared to baseline, but within normal limits. The groups were similar within each evaluation day. This is the first short term prospective randomized double blind study comparing PIMO to DIG or PL additionally to conventional therapy (ACEi and furosemide) for dogs with HF due to CDMVD. It was observed an early significant clinical improvement in dogs receiving PIMO compared to those receiving DIG or PL. The increase in early mitral inflow velocity (E-wave) on day 28 for PIMO group is suggestive of diastolic dysfunction improvement, but this is only one variable related to diastolic function. Creatinine concentration increased in PIMO group, although it remained within normal range. This result must be explored in later studies. Regarding the exercise intolerance assessment in a QoLQ, it must be aware that the owner evaluation is strongly influenced by the level of exercise that the dog is regularly submitted. Considering that most of the times, small breed dogs in a more advanced age is probably more sedentary and this fact surely precludes the owner to assess the exercise capacity. A more objective evaluation of the exercise tolerance should be considered in further clinical trials. Probably because of the small number of animals included in this study, differences in other studied variables were not found. The short-term follow-up of these patients may also have influenced the lack of differences among groups. Considering that stronger clinical evidence is needed to guide clinical decisions, longer prospective studies are also needed to compare the effects of DIG and PIMO, as well as to consider the benefits of the use or not of DIG associated with PIMO for dogs in HF due to CDMVD.
MMVD dogs with clinical signs of heart failure were enrolled in a prospective double-blind, randomized, placebo-controlled study to compare the short-term effect of G-CSF (n=17) with control group (n=13) for identical periods. Clinical, hematological, and cardiovascular assessments were performed on days 0, 1, 3, and 7. Follow-up examination was conducted four weeks after the study. Results: Dogs treated with G-CSF had a significantly elevated white blood cell (WBC) (x10^3/μL) count at day 3 compared with baseline (from 10.23±4.42 to 42.84±11.84; P=.000). The WBC population was also changed (elevated neutrophils and decreased lymphocytes) and the numbers of CD34+ cells in the peripheral blood were also increased at day 3. However, the results of clinical, laboratory, and echocardiographic assessments did not differ significantly between the G-CSF treatment and control groups after four weeks. Conclusions: G-CSF administration elevated the peripheral WBC count, especially neutrophils, and recruited hematopoietic stem cells. However, positive effects of G-CSF on cardiac function were not detected during short-term monitoring.

Publication Type
Journal article.
Degenerative mitral valve disease is the most common acquired heart disease in dogs. In recent years, the diagnostic methods have advanced and therapeutic options have been evaluated in several studies. To be able to classify and treat this disease uniformly, it is strongly advised to use the four-stage CHIEF (Canine Heart Failure International Expert Forum) classification scheme. While there is consent regarding the treatment of symptomatic dogs (CHIEF C), the optimal treatment of asymptomatic dogs (CHIEF B) has not been agreed upon. The aim of this article is to present and discuss current scientific knowledge enabling the best possible care of dogs with degenerative mitral valve disease.

Heart rate variability (HRV) and echocardiography were performed in 14 dogs with mitral regurgitation (MR) before and after 14 days of 0.5 mg/kg/day of enalapril treatment. All dogs were in heart failure stages B1 and B2. After enalapril treatment, left ventricular end diastolic diameter (LVEDd), left ventricular end diastolic diameter normalized for body weight (LVEDdN) and percent mitral regurgitant jet decreased (P<0.05). The diastolic blood pressure decreased (P<0.05). Increased time domain parameters of HRV were found. For frequency domain analysis, the total frequency (TF) increased significantly (P<0.05). The normalized low frequency (LF norm) decreased while normalized high frequency (HF norm) increased causing significant reduction in LF/HF (P<0.05). Before enalapril treatment, LF was correlated with end diastolic volume (EDV) (P<0.01) and LVEDd (P<0.05). In conclusion, MR dogs receiving enalapril treatment for 14 days had increased cardiac parasympathetic tone while sympathetic tone was suppressed. The decreased sympathetic activity corresponded to the reduction in cardiac preload and afterload.
Abstract

Background: Pimobendan and benazepril are frequently used with diuretics to treat dogs in congestive heart failure (CHF) caused by myxomatous mitral valve disease (MMVD). Aim: To compare the short-term effects of pimobendan versus benazepril on pump function, heart size, and neuroendocrine profile in dogs with CHF caused by MMVD. Animals: Sixteen client-owned dogs. Material and methods: Seven-day prospective single-blinded study of dogs stabilized on furosemide monotherapy, randomized to pimobendan (0.4-0.6 mg/kg/day) or benazepril (0.25-1.0 mg/kg/day). Dogs had first-pass radionuclide angiocardiography, and heart size was measured by radiography and echocardiography. Circulating neuroendocrine hormones were measured. Results: Baseline variables did not differ between treatment groups. Greater decreases in the pimobendan than in the benazepril group were found for heart rate (P=.001), heart rate-normalized pulmonary transit time (P=.02), left atrial size (P=.03), and systolic and diastolic left ventricular diameters (P<.001 and P=.03, respectively) and volumes (P<.001 and P=.02, respectively), whereas ejection fraction increased more (P=.02) in the pimobendan group. Of the neuroendocrine hormones, only N-terminal proatrial natriuretic peptide (NT-ProANP) differed (P=.04) between groups. Within groups, plasma aldosterone increased (P=.01), and NT-proANP (P=.01) and NT-proB-type (P=.02) natriuretic peptide decreased in the pimobendan group, and NT-proANP (P=.02) and plasma vasopressin (P=.01) decreased in the benazepril group. Conclusions and Clinical Importance: Pimobendan improves short-term cardiac function more than benazepril in dogs with CHF caused by MMVD. Pimobendan treatment enables the heart to work at smaller end-systolic and diastolic dimensions while maintaining adequate forward stroke volume. Some of the treatment responses found in neuroendocrine profile might have therapeutic relevance.
Longitudinal analysis of quality of life, clinical, radiographic, echocardiographic, and laboratory variables in dogs with myxomatous mitral valve disease receiving pimobendan or benazepril: the QUEST Study.

Source
Journal of Veterinary Internal Medicine; 2013. 27(6):1441-1451. 38 ref.

Publisher
Wiley-Blackwell
Location of Publisher
Boston
Country of Publication
USA

Abstract
Background: Myxomatous mitral valve disease (MMVD) is an important cause of morbidity and mortality in dogs. Objectives: To compare, throughout the period of follow-up of dogs that had not yet reached the primary endpoint, the longitudinal effects of pimobendan versus benazepril hydrochloride treatment on quality-of-life (QoL) variables, concomitant congestive heart failure (CHF) treatment, and other outcome variables in dogs suffering from CHF secondary to MMVD. Animals: A total of 260 dogs in CHF because of MMVD. Methods: A prospective single-blinded study with dogs randomized to receive pimobendan (0.4-0.6 mg/kg/day) or benazepril hydrochloride (0.25-1.0 mg/kg/day). Differences in outcome variables and time to intensification of CHF treatment were compared. Results: A total of 124 dogs were randomized to pimobendan and 128 to benazepril. No difference was found between groups in QoL variables during the trial. Time from inclusion to 1st intensification of CHF treatment was longer in the pimobendan group (pimobendan 98 days, IQR 30-276 days versus benazepril 59 days, IQR 11-121 days; P=.0005). Postinclusion, dogs in the pimobendan group had smaller heart size based on VHS score (P=.013) and left ventricular diastolic (P=.035) and systolic (P=.0044) dimensions, higher body temperature (P=.030), serum sodium (P=.0027), and total protein (P=.0003) concentrations, and packed cell volume (P=.030). Incidence of arrhythmias was similar in treatment groups. Conclusions and Clinical Importance: Pimobendan versus benazepril resulted in similar QoL during the study, but conferred increased time before intensification of CHF treatment. Pimobendan treatment resulted in smaller heart size, higher body temperature, and less retention of free water.

Publication Type
Journal article.

Accession Number
20133351472

Author
Lefebvre, H. P.; Ollivier, E.; Atkins, C. E.; Combes, B.; Concordet, D.; Kaltsatos, V.; Baduel, L.

Title
Safety of spironolactone in dogs with chronic heart failure because of degenerative valvular disease: a population-based, longitudinal study.

Source
Journal of Veterinary Internal Medicine; 2013. 27(5):1083-1091. 34 ref.

Publisher
Wiley-Blackwell
Location of Publisher
Boston
Country of Publication
USA

Abstract
Background: Spironolactone treatment in humans is associated with an increased risk of hyperkalemia and renal dysfunction. Hypothesis: Dogs with cardiac disease treated with spironolactone, in addition to conventional therapy, are not at higher risk for adverse events (AEs) than those receiving solely conventional therapy. Animals: One hundred and ninety-six client-owned dogs with naturally occurring myxomatous mitral valve disease. Methods: Prospective, double-blinded field study with dogs randomized to receive either
spironolactone (2 mg/kg once a day) or placebo in addition to conventional therapy (angiotensin-converting enzyme inhibitor, plus furosemide and digoxin if needed). Safety was compared between treatment groups, using the frequency of AEs, death caused by cardiac disease, renal disease, or both, and variations in serum sodium, potassium, urea, and creatinine concentrations. For the latter, population-specific reference intervals were established and out of range values (ORV) analyzed. Results: The number of AEs was similar in the spironolactone and reference groups (188 and 208, respectively), when followed for median duration of 217 days (range [2-1,333]). At each study time point, the percentage of dogs showing ORV was similar between groups. There were a higher number of deaths because of cardiac disease, renal disease or both in the reference group (30.7% versus 13.7%) (P=.0043). Conclusions and Clinical Importance: Dogs with heart failure receiving spironolactone in addition to conventional treatment are not at a higher risk for AEs, death caused by cardiac disease, renal disease, or both, hyperkalemia, or azotemia.

Publication Type
Journal article.

Accession Number
20133270672

Author
Cunningham, S. M.; Rush, J. E.; Freeman, L. M.

Title
Short-term effects of atorvastatin in normal dogs and dogs with congestive heart failure due to myxomatous mitral valve disease.

Source
Journal of Veterinary Internal Medicine; 2013. 27(4):985-989. 15 ref.

Publisher
Wiley-Blackwell

Location of Publisher
Boston

Country of Publication
USA

Abstract
Background: 3-Hydroxy-3-methylglutaryl coenzyme A reductase inhibitors (statins) may improve heart failure class and survival in people with congestive heart failure (CHF) of various etiologies. Hypothesis/Objectives: To evaluate the tolerability of atorvastatin in healthy dogs, and the short-term effects of atorvastatin on clinical markers of disease severity, lipid profiles, and markers of systemic inflammation and oxidative stress in dogs with CHF. Animals: Eleven normal dogs and 12 client-owned animals with CHF attributable to myxomatous mitral valve disease. Methods: Prospective nonblinded observational study. Normal dogs (n=11) were first treated with atorvastatin and re-evaluated after 14 and 30 days for clinical tolerability and alterations in certain laboratory results. Subsequently, dogs with CHF (n=12) were treated with atorvastatin at a dosage of 2 mg/kg q24h for 8 weeks. Echocardiography, blood pressure (BP), quality of life questionnaire, and blood sampling were performed pre and post atorvastatin administration. Results: Atorvastatin was well tolerated and did not result in apparent adverse effects or biochemical abnormalities in healthy dogs and in dogs with CHF. Healthy dogs experienced a decrease in total cholesterol (TC) concentration (P=.03) after atorvastatin administration. Decreases in TC concentration (P=.02), non-HDL cholesterol concentration (P=.02), total white blood cell count (P=.03), neutrophils (P=.01), and systolic BP (P=.01) were noted in the CHF group after 8 weeks of atorvastatin. Conclusions and Clinical Importance: Atorvastatin was well tolerated at clinically relevant doses in healthy dogs and dogs with CHF. Further investigation into the effects of statin treatment in dogs with CHF is warranted.

Publication Type
Journal article.
Accession Number
20133103596
Author
Oyama, M. A.
Title
An everyday approach to canine degenerative mitral valve disease.
Source
Publisher
VetMed Communications
Location of Publisher
Glen Mills
Country of Publication
USA
Abstract
The prevalence, risk factors, clinical aspects, diagnosis, management and treatment of degenerative mitral valve disease (DMVD) in dogs are discussed. The importance of physical examination and radiography in the diagnosis and management of DMVD are highlighted.
Publication Type
Journal article.

Accession Number
20123280956
Title
Torsemide and fusosemide treatment of heart failure from mitral valve disease.
Source
Publisher
Elsevier Inc.
Location of Publisher
Philadelphia
Country of Publication
USA
Publication Type
Journal article.

Accession Number
20123113323
Author
Peddle, G. D.; Singletary, G. E.; Reynolds, C. A.; Trafny, D. J.; Machen, M. C.; Oyama, M. A.
Title
Effect of torsemide and furosemide on clinical, laboratory, radiographic and quality of life variables in dogs with heart failure secondary to mitral valve disease.
Source
Publisher
Elsevier Ltd
Location of Publisher
Oxford
Country of Publication
UK

Abstract
Objectives: Diuretic therapy reduces preload and relieves congestion secondary to cardiac dysfunction. Torsemide (torasemide) is a loop diuretic with longer duration of action, decreased susceptibility to diuretic resistance, and adjunctive aldosterone antagonist properties compared with furosemide. We hypothesized that torsemide would be well tolerated and no less effective than furosemide at diuresis, control of clinical signs, and maintenance of quality of life (QOL) in dogs with congestive heart failure (CHF). Animals, materials and methods: Seven client-owned dogs with stable CHF receiving twice daily oral furosemide and adjunctive medications. Utilizing a double-blinded, randomized, crossover design, dogs were administered either oral furosemide at their current dose or an equivalent oral dose of torsemide (1/10 of the daily furosemide dose divided into twice daily dosing) on day 0. Crossover occurred at day 7 and the study ended on day 14. Clinical, laboratory, radiographic, and QOL variables were evaluated on days 0, 7 and 14. Results: No dogs developed recurrent CHF during the study. Mean furosemide dose on day 0 was 5.13 mg/kg/day (range 2.8-9.6). Following torsemide treatment, creatinine (P=0.020), urea nitrogen (P=0.013), phosphorus (P=0.032), albumin (P=0.019), carbon dioxide (P=0.015) and anion gap (P=0.005) were significantly increased, and urine specific gravity (P=0.004) and chloride (P=0.021) were significantly decreased compared with furosemide dosing. No differences in QOL were found. Conclusions: Results indicate that torsemide is equivalent to furosemide at controlling clinical signs of CHF in dogs and is likely to achieve greater diuresis vs. furosemide. Larger clinical trials evaluating torsemide as a first or second-line loop diuretic for congestive heart failure in dogs are warranted.

Publication Type
Journal article.

<26>
Accession Number
20123113315
Author
Atkins, C. E.; Haggstrom, J.
Title
Pharmacologic management of myxomatous mitral valve disease in dogs.
Source
Publisher
Elsevier Ltd
Location of Publisher
Oxford
Country of Publication
UK
Abstract
Myxomatous mitral valve disease (MMVD) causing mitral regurgitation is the most important disease of the heart in small animal cardiovascular medicine. Because MMVD is an example of a chronic disease that progresses from mild to severe over years, treatment strategies change with the stage of the disease. In this review the treatment options are compared and contrasted as they are discussed relative to the recently published ACVIM consensus statement regarding the treatment of MMVD. Results from clinical trials and evidence-based medicine are likely to provide significant improvements in the management of MMVD in the coming decades.
Publication Type
Journal article.

<27>
Accession Number
20123027677
This article primarily refers to the management of the most common causes of heart failure seen in general practice, such as mitral valve disease (MVD) and dilated cardiomyopathy (DCM). These both lead to left-sided congestive heart failure, typically resulting in pulmonary oedema. It also follows on from the article on "Recognising and diagnosing heart failure in the dog" published in VT41.44. It is not possible to cover every aspect of heart failure management within the word limit of this article, so I have focused on what I believe is the most common presentation to practitioners: the outpatient case. This article reflects my own personal experience and perspective.
animals that received only enalapril. Therefore, analysis of results showed that monotherapy based on enalapril maleate showed better efficiency of symptoms control in patients with CHF functional class Ib.

### Publication Type
Journal article.

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### <29>
**Accession Number**
20113311202

**Author**
Johnson, M. S.

**Title**
An update on mitral valve disease (Endocardiosis) in dogs.

**Source**

**Publisher**
UK Vet Publications

**Location of Publisher**
Newbury

**Country of Publication**
UK

**Abstract**
Mitral valve disease, MVD, occurs chiefly in small breed dogs. In large breeds this is an uncommon condition. Clinical findings and progression of the disease may be somewhat different in larger compared to smaller breeds. More rapid progression may occur due to factors which are mentioned in the article. Thoracic radiographs taken either conscious or under sedation are recommended in symptomatic dogs. A blood test to measure Pro BNP is available but its limitations should be recognised. Echocardiography is more useful in large breeds, mainly to differentiate from DCM. Therapy is highlighted. Pulmonary hypertension, a complication in a significant number of dogs with MVD, is discussed and its treatment outlined.

### Publication Type
Journal article.

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### <30>
**Accession Number**
20113300597

**Author**
Schober, K. E.; Hart, T. M.; Stern, J. A.; Li, X. B.; Samii, V. F.; Zekas, L. J.; Scansen, B. A.; Bonagura, J. D.

**Title**
Effects of treatment on respiratory rate, serum natriuretic peptide concentration, and Doppler echocardiographic indices of left ventricular filling pressure in dogs with congestive heart failure secondary to degenerative mitral valve disease and dilated cardiomyopathy.

**Source**

**Publisher**
American Veterinary Medical Association

**Location of Publisher**
Schaumburg

**Country of Publication**
USA

**Abstract**
Objective - To evaluate the effects of treatment on respiratory rate, serum natriuretic peptide concentrations, and Doppler echocardiographic indices of left ventricular filling pressure in dogs with congestive heart failure (CHF) secondary to degenerative mitral valve disease (MVD) and dilated...
cardiomyopathy (DCM). Design - Prospective cohort study. Animals - 63 client-owned dogs. Procedures - Physical examination, thoracic radiography, analysis of natriuretic peptide concentrations, and Doppler echocardiography were performed twice, at baseline (examination 1) and 5 to 14 days later (examination 2). Home monitoring of respiratory rate was performed by the owners between examinations. Results - In dogs with MVD, resolution of CHF was associated with a decrease in respiratory rate, serum N-terminal probrain natriuretic peptide (NT-proBNP) concentration, and diastolic functional class and an increase of the ratio of peak velocity of early diastolic transmitral flow to peak velocity of early diastolic lateral mitral annulus motion (E:Ea Lat). In dogs with DCM, resolution of CHF was associated with a decrease in respiratory rate and serum NT-proBNP concentration and significant changes in 7 Doppler echocardiographic variables, including a decrease of E:Ea Lat and the ratio of peak velocity of early diastolic transmitral flow to isovolumic relaxation time. Only respiratory rate predicted the presence of CHF at examination 2 with high accuracy.

Conclusions and Clinical Relevance - Resolution of CHF was associated with predictable changes in respiratory rate, serum NT-proBNP concentration, and selected Doppler echocardiographic variables in dogs with DCM and MVD. Home monitoring of respiratory rate was simple and was the most useful in the assessment of successful treatment of CHF.

Publication Type
Journal article.

Accession Number
20113272221

Author
Franco, R. P.; Champion, T.; Pascon, J. P. E.; Pereira Neto, G. B.; Paulino Junior, D.; Camacho, A. A.

Title
Use of enalapril maleate, furosemide and spironolactone to treat dogs with degenerative myxomatous mitral valve.

Source
Ars Veterinaria; 2011. 27(2):85-93. 50 ref.

Publisher
Faculdade de Ciencias Agrarias e Veterinarias, Campus de Jaboticabal, UNESP

Location of Publisher
Jaboticabal

Country of Publication
Brazil

Abstract
Severe degenerative myxomatous mitral valve disease (DMMVD) is a common condition in dogs. Therefore, a clinical study was conducted to determine the effectiveness of different treatment protocols based on enalapril maleate, furosemide, spironolactone, and their associations, to treat dogs with DMMVD belonging to functional class II congestive heart failure (CHF). For this purpose, 20 dogs were divided into two groups (n=10), where the first received enalapril maleate (0.5 mg/kg) and furosemide (2 mg/kg) and the second enalapril maleate spironolactone (1 mg/kg) and furosemide, administered once a day for 56 days. The dogs were evaluated four different times regarding clinical signs, radiographic, electrocardiographic, echocardiographic and blood pressure. However, hematological and biochemical-serum, which included mainly serum concentrations of angiotensin converting enzyme (ACE) and aldosterone, were implemented at the beginning and end of the experiment. The results were characterized by animals with mitral murmur grade III to V/VI with reduced clinical signs after administration of therapeutic protocols. Laboratory tests revealed significant reduction (p<0.01) for values of ACE and aldosterone in both groups. The radiographic examination showed significant reductions (p<0.05) in VHS and variable wave Pms ECG in both groups. Moreover, the Doppler echocardiography showed significant decrease (p<0.05) variables LVD d/s IVS d/s, mean LA/Ao, FS% and the speed of mitral valve regurgitation. Therefore, the analysis of the results showed the effectiveness of treatment protocols used, especially when combined with spironolactone.

Publication Type
Journal article.
<32>
Accession Number
20113161404
Author
Keene, B.
Title
How to effectively treat canine mitral valve disease.
Source
Publisher
The North American Veterinary Conference
Location of Publisher
Gainesville
Country of Publication
USA
Publication Type
Conference paper.

<33>
Accession Number
20113136280
Author
Moise, N. S.
Title
The new era in medical management in canine mitral valve disease?
Source
Publisher
British Small Animal Veterinary Association
Location of Publisher
Qedgeley
Country of Publication
UK
Publication Type
Book chapter
Conference paper.

<34>
Accession Number
20103294911
Author
Borgarelli, M.; Haggstrom, J.
Title
Canine degenerative myxomatous mitral valve disease: natural history, clinical presentation and therapy. (Special Issue: Topics in cardiology.)
Source
Publisher
Myxomatous mitral valve disease is a common condition in geriatric dogs. Most dogs affected are clinically asymptomatic for a long time. However, about 30% of these animals present a progression to heart failure and eventually die as a consequence of the disease. Left atrial enlargement, and particularly a change in left atrial size, seems to be the most reliable predictor of progression in some studies, however further studies are needed to clarify how to recognize asymptomatic patients at higher risk of developing heart failure. According to the published data on the natural history of the disease and the results of published studies evaluating the effect of early therapy on delaying the progression of the disease, it seems that no currently available treatment delays the onset of clinical signs of congestive heart failure (CHF). Although the ideal treatment of more severely affected dogs is probably surgical mitral valve repair or mitral valve replacement, this is not a currently available option. The results of several clinical trials together with clinical experience suggest that dogs with overt CHF can be managed with acceptable quality of life for a relatively long time period with medical treatment including furosemide, an angiotensin-converting enzyme inhibitor, pimobendan, and spironolactone.

Pimobendan is a drug with both inotropic and vasodilatory properties and is widely used for the treatment of heart failure in dogs. The best evidence regarding its efficacy is derived from several clinical studies of dogs with the two most common conditions that result in heart failure: dilated cardiomyopathy (DCM) and degenerative mitral valve disease (DMVD). The main studies addressing the effectiveness of pimobendan in dogs with DCM and DVMD are discussed in this article.

Pimobendan is a drug with both inotropic and vasodilatory properties and is widely used for the treatment of heart failure in dogs. The best evidence regarding its efficacy is derived from several clinical studies of dogs with the two most common conditions that result in heart failure: dilated cardiomyopathy (DCM) and degenerative mitral valve disease (DMVD). The main studies addressing the effectiveness of pimobendan in dogs with DCM and DVMD are discussed in this article.
Pharmacoeconomic evaluation of the treatment of myxomatous mitral valve disease in dogs in Germany.

Source

Publisher
Schlutersche Verlagsgesellschaft mbH & Co. KG

Location of Publisher
Hannover

Country of Publication
Germany

Abstract
The aim of this pharmacoeconomic study was to estimate the cost-effectiveness of pimobendan compared to generic benazepril for the treatment of myxomatous mitral valve disease in dogs in Germany. A Markov model was developed including all the relevant disease stages and which reflected the treatment patterns used in Germany. The observation period was one year. The chosen effectiveness parameters were survival time (life days) and time without symptoms of heart insufficiency. Transition probabilities define the progression of the disease and the impact of the treatment and were mainly derived from published randomized clinical studies. The costs of drugs and veterinary services were defined from official price and veterinary tariff lists, valid as of 2009. The mean total costs of therapy were Euro 472.21 and Euro 285.23 for dogs on pimobendan and benazepril, respectively. During the one-year observation period, the mean survival time for dogs on pimobendan was 274 days and 129 days for dogs on benazepril. After one year, 51% of dogs on pimobendan were still alive but less than 4% of dogs on benazepril. The cost for one life day gained with pimobendan was calculated to be Euro 1.29. The costs for one day of treatment were less with pimobendan (Euro 1.72) than benazepril (Euro 2.21). Correspondingly, the lower total therapy costs associated with benazepril were merely attributed to the shorter survival times. On average, dogs on pimobendan spent 86 days without symptoms of heart insufficiency, whereas dogs on benazepril spent 15 days without symptoms. Comprehensive sensitivity analyses confirmed the robustness and transferability of the results to various dogs and different clinic structures.

Publication Type
Journal article.

Accession Number
20093283685

Author
Haggstrom, J.; Hoglund, K.; Borgarelli, M.

Title
An update on treatment and prognostic indicators in canine myxomatous mitral valve disease. (Special Issue: Chronic degenerative valvular disease - where are we now?)

Source
Journal of Small Animal Practice; 2009. 50(s1):25-33. many ref.

Publisher
Blackwell Publishing

Location of Publisher
Oxford

Country of Publication
UK

Abstract
Mitral regurgitation caused by myxomatous mitral valve disease is the most common cause for congestive heart failure and cardiac-related mortality in dogs. Typically, it takes several years for the disease to progress from mild, clinically silent myxomatous mitral valve disease to severe disease with signs of congestive heart failure. A proportion of dogs will never progress into congestive heart failure before they die from other causes or old age. Some variables have been shown to be predictive of onset of congestive heart failure and they might be useful to identify dogs that need more frequent monitoring and eventually treatment. Results
from several controlled clinical trials are available concerning medical treatment of dogs with myxomatous mitral valve disease with or without congestive heart failure. These trials provide estimates of treatment effects and also allow identification of other variables with prognostic value for the outcome after the onset of congestive heart failure. Use of prognostic variables together with qualitative and quantitative results from clinical drug trials may aid the clinician and owner to plan and decide on optimal management of the myxomatous mitral valve disease dog. The purpose of this article is to review the current knowledge of prognostic variables and therapy for this common condition in dogs.

Publication Type
Journal article.

<38>
Accession Number
20093283683
Author
Oyama, M. A.
Title
Neurohormonal activation in canine degenerative mitral valve disease: implications on pathophysiology and treatment. (Special Issue: Chronic degenerative valvular disease - where are we now?)
Source
Journal of Small Animal Practice; 2009. 50(s1):3-11. many ref.
Publisher
Blackwell Publishing
Location of Publisher
Oxford
Country of Publication
UK
Abstract
Neurohormonal systems play a critical role in canine degenerative mitral valve disease (DMVD). DMVD results in mitral regurgitation, which reduces forward cardiac output and increases intracardiac pressures. These changes trigger neurohormonal responses that ultimately result in maladaptive cardiac remodelling, congestion and heightened morbidity and mortality. Medical therapies such as ACE inhibitors and spironolactone derive their benefit by interrupting or suppressing these neurohormonal responses. Thus, knowledge of neurohormonal mechanisms can lead to a better understanding of how to treat DMVD.

Publication Type
Journal article.

<39>
Accession Number
20093276937
Author
Caro, A.; Ynaraja, E.; Montoya, J. A.
Title
Effects of short-term treatment with pimobendan in dogs with myxomatous valve disease.
Source
Publisher
Garuda Scientific Publications
Location of Publisher
Izatnagar
Country of Publication
India
Abstract
The aim of the study was to evaluate the short-term effects of pimobendan, a novel drug, in dogs with naturally occurring mitral valve myxomatous disease. The study involved twenty dogs with no previous treatment. The results show that pimobendan is well tolerated and can be administered effectively and safely in the treatment of congestive heart failure myxomatous mitral valve disease of the dog.

**Publication Type**
Journal article.

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**Effect of pimobendan or benazepril hydrochloride on survival times in dogs with congestive heart failure caused by naturally occurring myxomatous mitral valve disease: the QUEST study.**

**Background:** Myxomatous mitral valve disease (MMVD) continues to be an important cause of morbidity and mortality in geriatric dogs despite conventional therapy. Hypothesis: Pimobendan in addition to conventional therapy will extend time to sudden cardiac death, euthanasia for cardiac reasons, or treatment failure when compared with conventional therapy plus benazepril in dogs with congestive heart failure (CHF) attributable to MMVD. Animals: Two hundred and sixty client-owned dogs in CHF caused by MMVD were recruited from 28 centres in Europe, Canada, and Australia. Methods: A prospective single-blinded study with dogs randomized to PO receive pimobendan (0.4-0.6 mg/kg/d) or benazepril hydrochloride (0.25-1.0 mg/kg/d). The primary endpoint was a composite of cardiac death, euthanized for heart failure, or treatment failure. Results: Eight dogs were excluded from analysis. One hundred and twenty-four dogs were randomized to pimobendan and 128 to benazepril. One hundred and ninety dogs reached the primary endpoint; the median time was 188 days (267 days for pimobendan, 140 days for benazepril hazard ratio=0.688, 95% confidence limits [CL]=0.516-0.916, P=.0099). The benefit of pimobendan persisted after adjusting for all baseline variables. A longer time to reach the endpoint was also associated with being a Cavalier King Charles Spaniel, requiring a lower furosemide dose, and having a higher creatinine concentration. Increases in several indicators of cardiac enlargement (left atrial to aortic root ratio, vertebral heart scale, and percentage increase in left ventricular internal diameter in systole) were associated with a shorter time to endpoint, as was a worse tolerance for exercise. Conclusions and Clinical Importance: Pimobendan plus conventional therapy prolongs time to sudden death, euthanasia for cardiac reasons, or treatment failure in dogs with CHF caused by MMVD compared with benazepril plus conventional therapy.

**Publication Type**
Journal article.

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**Effect of pimobendan or benazepril hydrochloride on survival times in dogs with congestive heart failure caused by naturally occurring myxomatous mitral valve disease: the QUEST study.**

**Background:** Myxomatous mitral valve disease (MMVD) continues to be an important cause of morbidity and mortality in geriatric dogs despite conventional therapy. Hypothesis: Pimobendan in addition to conventional therapy will extend time to sudden cardiac death, euthanasia for cardiac reasons, or treatment failure when compared with conventional therapy plus benazepril in dogs with congestive heart failure (CHF) attributable to MMVD. Animals: Two hundred and sixty client-owned dogs in CHF caused by MMVD were recruited from 28 centres in Europe, Canada, and Australia. Methods: A prospective single-blinded study with dogs randomized to PO receive pimobendan (0.4-0.6 mg/kg/d) or benazepril hydrochloride (0.25-1.0 mg/kg/d). The primary endpoint was a composite of cardiac death, euthanized for heart failure, or treatment failure. Results: Eight dogs were excluded from analysis. One hundred and twenty-four dogs were randomized to pimobendan and 128 to benazepril. One hundred and ninety dogs reached the primary endpoint; the median time was 188 days (267 days for pimobendan, 140 days for benazepril hazard ratio=0.688, 95% confidence limits [CL]=0.516-0.916, P=.0099). The benefit of pimobendan persisted after adjusting for all baseline variables. A longer time to reach the endpoint was also associated with being a Cavalier King Charles Spaniel, requiring a lower furosemide dose, and having a higher creatinine concentration. Increases in several indicators of cardiac enlargement (left atrial to aortic root ratio, vertebral heart scale, and percentage increase in left ventricular internal diameter in systole) were associated with a shorter time to endpoint, as was a worse tolerance for exercise. Conclusions and Clinical Importance: Pimobendan plus conventional therapy prolongs time to sudden death, euthanasia for cardiac reasons, or treatment failure in dogs with CHF caused by MMVD compared with benazepril plus conventional therapy.

**Publication Type**
Journal article.
Author
Chetboul, V.; Lefebvre, H. P.; Sampedrano, C. C.; Gouni, V.; Saponaro, V.; Serres, F.; Concordet, D.; Nicolle, A. P.; Pouchelon, J. L.

Title
Comparative adverse cardiac effects of pimobendan and benazepril monotherapy in dogs with mild degenerative mitral valve disease: a prospective, controlled, blinded, and randomized study. (2nd Congress Abstracts, Naas, Kildare, Ireland, 2-3 February 2007.)

Source

Publisher
American College of Veterinary Internal Medicine

Location of Publisher
Lakewood

Country of Publication
USA

Abstract
Background: Pimobendan (PIMO) is an inodilator that may have some beneficial effects in canine degenerative mitral valve disease (MVD). However, little information is available about its cardiac effects in dogs without systolic myocardial dysfunction. Hypothesis: Compared to benazepril (BNZ), an angiotensin-converting enzyme inhibitor, PIMO may worsen valve regurgitation in early canine MVD. Animals: Twelve Beagles with asymptomatic MVD were randomized into 2 groups (n=6) receiving BNZ or PIMO at dosages of 0.25 mg/kg PO q24h and q12h respectively, for 512 days. Methods: The study followed a blinded, randomized, prospective, and parallel group design. After day 512, the dogs were necropsied, and cardiac histopathology was performed in a blinded manner. Results: A significant treatment effect was observed as soon as day 15 with increased systolic function in the PIMO group by comparison to baseline value as assessed by fractional shortening (P<.0001) and tissue Doppler variables (P=.001). Concurrently, the maximum area and peak velocity of the regurgitant jet signal increased (P<.001), whereas these variables remained stable in the BNZ group. Histologic grades of mitral valve lesions were more severe in the PIMO group than in the BNZ group. Moreover, acute focal hemorrhages, endothelial papillary hyperplasia, and infiltration of chordae tendinae with glycosaminoglycans were observed in the mitral valves of dogs from the PIMO group but not in those of the BNZ group. Conclusions and Clinical Importance: PIMO has adverse cardiac functional and morphologic effects in dogs with asymptomatic MVD. Additional investigation in dogs with symptomatic MVD is now warranted.

Publication Type
Journal article.

Accession Number
20073127288

Author
Woolley, R.; Smith, P.; Munro, E.; Smith, S.; Swift, S.; Devine, C.; Corcoran, B.; French, A.

Title
Effects of treatment type on vertebral heart size in dogs with myxomatous mitral valve disease.

Source

Publisher
Therapeutic Solutions LLC

Location of Publisher
Newtown

Country of Publication
USA

Abstract
The effect of treatment protocols including either pimobendan or ramipril on vertebral heart size (VHS) in dogs with class II-III (Scandinavian-modified NYHA system) congestive heart failure (CHF) due to
myxomatous mitral valve disease (MMVD) was assessed. Radiographs from 42 dogs were analysed with 21 randomized to pimobendan and 21 to ramipril. VHS was measured prior to treatment at inclusion (Month 0) and at Months 1, 3, and 6. The least square means for the individual treatment groups showed that, for the pimobendan group, a reduction in VHS at Months 1 and 3 of treatment was observed with an increase at Month 6. In the ramipril group, an increase in VHS occurred at Months 1, 3, and 6. A difference in the treatment group least square means was demonstrable after 1 month of treatment and persisted for the remainder of the study period. Treatment with pimobendan led to lower VHS than treatment with ramipril. The clinical relevance of the changes observed in this study is as yet unclear and needs further investigation. However, it can be speculated that a reduction in VHS is a positive outcome and pimobendan would appear to be more beneficial than ramipril in this respect.

Abstract
Pimobendan has a dual mechanism of action: it increases myocardial contractility by increasing calcium sensitization to troponin C and it promotes vasodilation by inhibiting PDEIII. This study examined the effects of pimobendan on cardiac function, hemodynamics, and neurohormonal factors in dogs with mild mitral regurgitation (MR). The dogs were given 0.25 mg/kg of pimobendan orally every 12 hr for 4 weeks. With pimobendan, the heart rate and stroke volume did not change, but the systolic blood pressure gradually decreased and the degree of mitral valve regurgitation tended to decrease. Renal blood flow was significantly increased and the glomerular filtration rate was slightly increased at 2 and 4 weeks. Furthermore, over the 4-week period, the plasma norepinephrine concentration decreased significantly, the systolic index increased slightly, the left atrial diameter and the left ventricular diameters decreased significantly, and the heart size improved. Given these results, pimobendan appears to be useful for treating MR in dogs. However, further long-term studies of pimobendan involving a larger number of dogs with mild and moderate MR are needed to establish the safety of pimobendan and document improvements in quality of life.
Efficacy and safety of pimobendan in canine heart failure caused by myxomatous mitral valve disease.

Source

Publisher
British Veterinary Association
Location of Publisher
London
Country of Publication
UK

Abstract
Objectives: To evaluate the clinical efficacy and safety of pimobendan by comparing it with ramipril over a six-month period in dogs with mild to moderate heart failure (HF) caused by myxomatous mitral valve disease (MMVD). Methods: This was a prospective randomised, single-blind, parallel-group trial. Client-owned dogs (n=43) with mild to moderate HF caused by MMVD were randomly assigned to one of two groups, which received either pimobendan (P dogs) or ramipril (R dogs) for six months. The outcome measures studied were: adverse HF outcome, defined as failure to complete the trial as a direct consequence of HF; maximum furosemide dose (mg/kg/day) administered during the study period; and any requirement for additional visits to the clinic as a direct consequence of HF. Results: Treatment with pimobendan was well tolerated compared with treatment with ramipril. P dogs were 25 per cent as likely as R dogs to have an adverse HF outcome (odds ratio 4.09, 95 per cent confidence interval 1.03 to 16.3, P=0.046). Clinical Significance: R dogs had a higher overall score and thus may have had more advanced disease than P dogs at baseline (P=0.04). These results should be interpreted cautiously but such a high odds ratio warrants further investigation.

Publication Type
Journal article.