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Assessment of the diagnostic accuracy of circulating natriuretic peptide concentrations to distinguish between cats with cardiac and non-cardiac causes of respiratory distress

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KEYWORDS
Cardiac biomarkers;
Respiratory distress;
Sensitivity;
Specificity

Abstract *Objectives:* To determine if serum natriuretic peptide (NP) concentrations could distinguish cardiac from non-cardiac causes of respiratory distress (RD) in cats.
Animals: Seventy-four cats from 1 university hospital were used.
Methods: Serum NP concentrations were measured in 41 cats with non-cardiac respiratory distress (RD-NC) and compared to 33 cats with RD due to congestive heart failure (RD + CHF) using sandwich enzyme immunoassays (ELISA).
Results: RD-NC cats had lower ($P = 0.0001$) median NT-proANP and NT-proBNP concentrations (614 and 45 fmol/mL, respectively) than RD + CHF cats (1690 and 523 fmol/mL, respectively). The area under the curve was 0.88 and 0.96 for the receiver operating curve analysis of the diagnostic accuracy of NT-proANP and NT-proBNP concentrations to discriminate RD + CHF from RD-NC cats ($P = 0.036$). An optimum cut-off concentration of 986 fmol/mL for NT-proANP and 220 fmol/mL for NT-proBNP accurately discriminated RD-NC from RC + CHF cats with a sensitivity of 93.8% and 93.9% and a specificity of 80.3% and 87.8%, respectively.

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Conclusions: Serum NP concentrations were different in RD + CHF cats compared to RD-NC cats. Evaluation of circulating NP concentrations may be helpful in the initial approach to cats presenting with respiratory distress, particularly if advances in ELISA technology result in a rapid cage-side test.

Introduction

Cats with signs of respiratory distress can present a significant diagnostic challenge. The sedentary lifestyle of domestic cats frequently means that signs of cardio-respiratory disease may not be noticed by owners until the disease process is advanced and such animals often present in a critical condition. The ability to distinguish cardiac from non-cardiac causes of respiratory distress is a vital initial step in achieving an accurate diagnosis and appropriate treatment. It is often not possible to do this on the basis of history and physical examination, and the compromised state of cats with severe respiratory distress often limits diagnostic evaluation. Frequently, the presence of heart disease cannot be identified by thoracic radiography because the concentric hypertrophy characteristic of hypertrophic cardiomyopathy (HCM, the most common feline cardiac disease) is not easily recognized and moderate atrial enlargement may not be apparent. Furthermore, cardiogenic pulmonary edema in cats can be diffuse and unevenly distributed or concentrated in the middle lung lobe. This makes differentiating pulmonary edema from other infiltrative lung diseases particularly difficult in cats.[1] Pleural fluid will often obscure the cardiac silhouette making radiographic assessment of the heart impossible. Echocardiography may assist in the diagnosis of CHF but this requires expensive equipment and a level of expertise, which may not be available at the time of emergency presentation. Empiric therapy, such as diuretics, corticosteroids, bronchodilators and antibiotics, is often given in an attempt to alleviate clinical signs but in the absence of a more accurate diagnosis this approach may be detrimental.

Circulating concentrations of NPs are increased in human patients with heart failure when compared to normal populations.[2] Recently several studies have shown circulating B-type NP concentration to be an accurate predictor of CHF, enabling patients with CHF to be differentiated from those with non-cardiac causes of dyspnea.[3–9]

Increased concentrations of circulating NPs have been documented in dogs with CHF.[10–13] In 3 recent studies, plasma NP concentrations enabled discrimination between dogs with cardiac and non-cardiac dyspnea.[14–16] In contrast to dogs and humans, relatively little is known about the value of NP testing in cats. Preliminary studies indicate that both ANP and BNP show potential as markers of myocardial disease.[c] A recent study demonstrated that circulating NT-proANP and particularly NT-proBNP concentrations measured by ELISA can be used to identify cats with heart disease and HF.[17]

The aim of this study was to investigate the ability of serum NT-proANP and NT-proBNP concentrations to distinguish cats with CHF from cats with non-cardiac causes of respiratory distress.

Animals, materials and methods

Animals

Consecutive feline cases with signs of respiratory distress (defined as tachypnea, paradoxical breathing pattern, stertor, stridor, open mouth breathing or any combination thereof) presenting to either the cardiology or emergency and critical care service of the Royal Veterinary College over an 18-month period were recruited for the study. Great care was taken to only include cats with respiratory distress of non-cardiac origin where a definitive cause for the respiratory distress had been ascertained. Exclusion criteria for the cats with respiratory distress of non-cardiac origin were animals with multiple potential causes for their respiratory distress such as blood loss, pain, arrhythmias and pulmonary contusion seen in trauma cases.

Materials and methods

A diagnosis was based on physical examination findings and the results of appropriate diagnostic tests. Diagnostic tests were not standardized for

[c] Sisson DD, Oyama MA, Solter PF. Plasma levels of ANP, BNP, epinephrine, norepinephrine, serum aldosterone, and plasma rennin activity in healthy cats and cats with myocardial disease (abstract). J Vet Intern Med 2003;17:483.