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REVIEW

Management of acute heart failure in cats[☆]



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Received 25 April 2015; received in revised form 13 September 2015; accepted 17 September 2015

KEYWORDS

Cat;
Heart failure;
CHF;
Dyspnoea;
Therapy

Abstract Acute heart failure in cats represents a complex clinical situation in feline practice and this review has been designed to focus on the description of acute heart failure in cats, the diagnostic approach and clinical management of acutely decompensated feline cardiac patients. The authors acknowledge the lack of scientific evidence regarding many treatments used for heart disease in cats, and hence their approach may differ from recommendations given by other cardiologists. Every individual cardiac cat is also different, and it is important that all treatments are carefully tailored to the individual. Therefore this review provides generic advice based on the authors' personal experience but should not provide prescriptive guidelines on when to use particular drugs and doses and readers are encouraged to seek the latest information when managing these challenging cases.

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[☆] A unique aspect of the Journal of Veterinary Cardiology is the emphasis of additional web-based images permitting the detailing of procedures and diagnostics. These images can be viewed (by those readers with subscription access) by going to <http://www.sciencedirect.com/science/journal/17602734>. The issue to be viewed is clicked and the available PDF and image downloading is available via the Summary Plus link. The supplementary material for a given article appears at the end of the page. Downloading the videos may take several minutes. Readers will require at least Quicktime 7 (available free at <http://www.apple.com/quicktime/download/>) to enjoy the content. Another means to view the material is to go to <http://www.doi.org> and enter the doi number unique to this paper which is indicated at the end of the manuscript.

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<http://dx.doi.org/10.1016/j.jvc.2015.09.007>

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Abbreviations

AHF	acute heart failure
AO	aorta
ATE	arterial thromboembolism
CHF	congestive heart failure
HF	heart failure
LA	left atrium
LV	left ventricle
RA	right atrium
VHS	vertebral heart score

Introduction

Heart failure (HF) is defined as a complex clinical syndrome that can result from any structural or functional cardiac disorder that impairs the ability of the ventricle to fill with or eject blood.¹ The clinical manifestations of HF may result from a variety of cardiac disorders, which may include diseases affecting the myocardium (i.e., cardiomyopathies), endocardium (i.e., valvular diseases), or great vessels (i.e., systemic and pulmonary hypertension, embolisms). The majority of cats with HF present clinical signs relating to an impairment of left ventricular (LV) myocardial function. LV functional abnormalities in cats are often observed in patients with hypertrophic ventricular wall and reduced ventricular lumen; however, significant myocardial dysfunction can also be observed in cats with normal myocardial thickness and normal LV lumen and in cats with severe LV dilatation and markedly reduced ejection fraction.² Although diastolic dysfunction is the predominant pathophysiological mechanism in cats with cardiomyopathy, systolic and diastolic dysfunction can coexist, so a stringent differentiation between systolic and diastolic failure may be less relevant for the clinical management of these patients.³

As observed in humans and other animal species, the cardinal manifestations of HF in cats are dyspnoea and fatigue, which often limit exercise tolerance and interaction. However, exercise intolerance is frequently unnoticed in domestic cats because of their common sedentary life style. Consequently, signs of fluid retention (congestive failure) are often the only abnormalities observed by the owners, such as tachypnoea/dyspnoea secondary to pulmonary oedema and/or pleural effusion and abdominal enlargement caused by ascites. Therefore, the terms HF and congestive heart failure (CHF) are almost interchangeable in feline cardiac patients.³

Indeed, acute heart failure (AHF) is most commonly observed in cats with cardiomyopathy (CM), but it has also been reported in a variety of other pathologies, such as degenerative valve disease,⁴ endocarditis,^{5,6} congenital abnormalities,^{7–12} tachycardiomyopathy,¹³ myocardial infarction,^{2,14} hyperthyroidism¹⁵ and even iatrogenic volume overload following aggressive fluid replacement, steroid therapy¹⁶ and hyperviscosity syndrome.¹⁷ Overall, it would be more appropriate to consider CHF as a clinical syndrome characterised by specific signs (i.e., tachypnoea/dyspnoea) in the medical history and signs on physical examination, thoracic radiography and ultrasonography (pulmonary oedema, pleural effusion and ascites). Cardiac biomarkers are very useful to detect the presence of myocardial damage (i.e., high-sensitivity cardiac troponin-I) or myocardial stress (NT-proBNP) although they cannot provide definitive confirmation of CHF. Therefore, a single diagnostic test for acute CHF does not exist and its diagnosis remains largely a clinical judgement based on a careful history collection and thorough clinical examination.¹

Acute heart failure vs. chronic heart failure

According to recent European Society of Cardiology guidelines for the diagnosis and treatment of HF in people, AHF can be defined as a rapid onset of signs of HF, and this often represents a life-threatening condition, which requires immediate hospitalisation and medical attention.¹⁸ Such description can comfortably be imported as a definition of acute CHF in feline cardiology. Unlike dogs, in which the vast majority of presenting patients progressively develop CHF following deterioration of a previously recognised cardiac condition (e.g. diagnosis of chronic degenerative mitral valve disease following detection of an audible heart murmur), cats with CHF may have never been previously diagnosed with a cardiac disease or even been suspected to have a heart problem, and they can present more unexpectedly in acute or hyper-acute failure.

The inception of clinical signs is often triggered by a stressful event (e.g. car journey, hospitalisation) or by a simple clinical procedure (e.g. restraint, forced recumbency for radiographic examination or echocardiography, blood sample, intravenous catheter placement). The sudden onset of CHF in these cases could be attributable to a rapid release of catecholamines, which induces generalised vasoconstriction and increased cardiac output (increased

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