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Prevalence and diagnostic characteristics of non-clinical mitral regurgitation murmurs in North American Whippets

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Abstract *Objectives:* To assess the prevalence of functional ejection murmurs and murmurs of mitral regurgitation (MR) due to myxomatous mitral valve disease in healthy whippets; to assess the diagnostic value of auscultation to detect MR; and investigate the relationship between age and presence of echocardiographically documented MR (MR_{echo}).
Animals: A total of 200 healthy client-owned Whippets, recruited at national shows between 2005 and 2009 were involved in this study.
Methods: Cross-sectional study. Dogs were examined by auscultation by one examiner and Doppler echocardiography by another, and results were compared. Prevalence of types of murmurs and MR_{echo} were calculated and correlated to age. Accuracy of auscultation to predict MR_{echo} was calculated.
Results: Left-sided systolic heart murmurs were detected in 185/200 (93%) of dogs. Left apical systolic murmurs (L_{apex}) were detected in 57/200 (29%) and left basilar systolic murmurs (L_{base}) in 128/200 of the dogs (64%). MR_{echo} was present in 76/200 (38%) dogs. Prevalence MR_{echo} was correlated with age ($r = 0.96$, $p=0.0028$). Mitral regurgitation detected by echocardiography was present in 12/78 (15%) of the dogs $\leq$ 2 years of age and in 59% of the dogs at 7–8 years old. Detection of L_{apex} predicted MR_{echo} with sensitivity 65%, specificity 94%, positive predictive value 86%, and negative predictive value 81%; and accuracy improved when only dogs with more intense L_{apex} (grade $\geq$ 3/6) were considered.

A portion of this information was previously presented: Stepien RL, Kellihan H, Luis Fuentes V. Accuracy of auscultation alone to identify mitral insufficiency in adult whippets (abstract). J Vet Intern Med 2011;25:1480.

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Conclusions: Systolic murmurs are common in North American Whippets and this breed exhibits a high prevalence of MR_{echo}, which may be documented at a relatively early age. Whippets with non-clinical MR_{echo} may not be identifiable by auscultation alone; echocardiographic examination may be required to exclude a diagnosis of MR. Louder heart murmurs allow more accurate localization in this population.

Abbreviations

L_{apex}	left apical systolic murmur
L_{base}	left basilar systolic murmur
LA	left atrium
LR	likelihood ratio
MMVD	myxomatous mitral valve disease
MR	mitral valve regurgitation
MR_{echo}	mitral valve regurgitation detected by echocardiography
MV	mitral valve
NPV	negative predictive value
PPV	positive predictive value
SE	sensitivity
SP	specificity

Introduction

Adult onset myxomatous mitral valvular heart disease (MMVD) resulting in valvular regurgitation is the most common form of heart disease in dogs and may account for up to 75—80% of canine heart disease cases [1]. This type of heart disease is more prevalent in some breeds, suggesting a heritable component. Genetic tests are currently lacking in these breeds, and 'screening' for this adult onset disease in breeding animals at risk is currently focused on detection of left apical systolic heart murmurs by auscultation, sometimes with additional testing by Doppler echocardiography [1—4].

'Athletic' or 'functional' heart murmurs (also called 'flow', 'physiologic', 'non-pathological' or 'innocent' murmurs) are associated with ejection of blood through normal valves and vessels. These murmurs are noted to be more common in healthy Sighthounds, athletic breeds and other breeds in some circumstances[c] [5—7]. Functional murmurs are typically loudest over the left heart base, and these systolic murmurs may be confused with the left apical systolic murmurs of mitral regurgitation (MR) [8]. Whippets are noted to be both at increased risk of MMVD [9] and to commonly have functional heart murmurs [10].

The aims of this prospective cross-sectional study were to assess the prevalence of functional ejection murmurs and of MR due to MMVD in a population of healthy North American Whippets, to assess the diagnostic value of auscultation to detect MR in this population and to investigate the relationship between age and presence of MR.

Animals, materials and methods

Dogs were prospectively recruited from a healthy population attending the American Whippet Club National Specialty between 2005 and 2009. Dogs were submitted for examination by their owners and enrolled without regard to age, breeding status, or athletic condition. Although no systematic overall health evaluation was performed, dogs with known systemic disease conditions were excluded and all dogs were without clinical signs of heart disease at the time of examination, based on owner history. Each dog contributed data from a single examination. This study was approved by the University of Wisconsin School of Veterinary Medicine Animal Care and Use Committee.

Physical examination

Cardiac auscultation was performed by one observer (RLS) blinded to any previous cardiac information known by the owner. Dogs stood at rest with their owners/handlers for auscultation, during which heart rate and presence of any heart murmurs were recorded. The most intense (i.e. highest grade) heart murmur detected per dog was used for analysis, and murmurs were characterized by timing (systolic vs. diastolic), intensity (grade 1—6 with grade 1 as the lowest detectable intensity murmur and grade 6 as a murmur audible with a stethoscope lifted slightly off the chest) and

[c] Olsen LH, Hjarback R, Pedersen HD. Physiological flow murmurs in Cavalier King Charles Spaniels (abstract). J Vet Intern Med. 2006;20(3):748.

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