Journal of Veterinary Cardiology (2016) **18**, 57—70

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Journal of Veterinary Cardiology
ESVC

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Cardiac pathology in Irish wolfhounds with heart disease

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Received 1 May 2015; received in revised form 4 October 2015; accepted 7 October 2015

KEYWORDS
Dilated cardiomyopathy;
Atrial fibrillation;
Atrial histopathology;
Ventricular histopathology

Abstract *Objectives:* To evaluate gross and histopathologic lesions in Irish wolfhounds (IWs) with atrial fibrillation (AF) and/or primary dilated cardiomyopathy (DCM) in different stages of disease.
Methods: Twenty-six formalin-fixed IW hearts were studied. Clinical diagnosis was based upon results of their most recent cardiovascular examinations including electrocardiography and echocardiography and categorized as normal (n = 4); preclinical (asymptomatic) DCM with AF (n = 6); DCM with congestive heart failure and AF (n = 4); AF with left ventricular reverse remodeling after DCM diagnosis (n = 3); AF without DCM (n = 7); and DCM with sinus rhythm (n = 2). All hearts were evaluated by one pathologist (HA) blinded to the clinical diagnosis.
Results: Ten of 15 DCM hearts showed mild to moderate multifocal myocardial fibrosis with variable diffuse adipocyte infiltration within the left and right ventricular myocardium. In five DCM hearts, there were no histopathological findings identified. Right atrial appendages from AF dogs with and without DCM had significantly more myocardial fibrosis and adipocyte infiltration compared with normal hearts and compared to left atrial appendages.
Conclusions: Gross and histological findings in the ventricular myocardium of IWs with clinical diagnosis of DCM were variable; in some dogs, histopathology was normal. In IWs, the etiology of DCM might be different from that in other breeds with conditions causing functional impairment rather than evident histological changes. Right and left atrial appendages from IWs with AF displayed substantial

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http://dx.doi.org/10.1016/j.jvc.2015.10.001

pathology (interstitial fibrosis and adipocytes) most prevalent in the right atrial appendages which may be correlated to the pathogenesis of AF. These preliminary findings merit further study.

Abbreviations

AF	atrial fibrillation
CHF	congestive heart failure
DCM	dilated cardiomyopathy
IVS	interventricular septum
IWs	Irish wolfhounds
LAA	left atrial appendage
LV	left ventricle
LV-RR	left ventricular reverse remodeling
RAA	right atrial appendage
RV	right ventricle
SD	standard deviation
SCD	sudden cardiac death
SR	sinus rhythm

Introduction

Canine dilated cardiomyopathy (DCM) is the most common acquired cardiovascular disease of large and giant breed dogs.[1–3] Irish wolfhounds (IWs) have a particular high prevalence of DCM and atrial fibrillation (AF).[4–6,c,d] The heritability of DCM has been recently described for IWs.[7,8] Breed specific reference values for two-dimensional (2D)- and M-mode echocardiographic measurements and characterization of the echocardiographic appearance of different stages of DCM in IWs have been established in earlier studies.[9,10]

Pathological investigations of hearts of dogs which died from heart failure because of DCM commonly show (bi)ventricular dilation and flattened papillary muscles. Degenerative mitral and tricuspid valvular changes are common but usually modest compared with those observed in dogs dying from valvular insufficiency due to myxomatous degeneration.[1] Histologic myocardial changes of dogs that died from DCM usually have been described as modest in relation to the severe degree of functional impairment observed clinically.[1] Basically, there have been two different types of canine DCM distinguished histologically, the "fatty infiltration-degenerative" type, mainly reported in Boxers and Doberman Pinschers, and the "attenuated wavy fiber" type of large- and medium-sized breeds.[11–14,e] The implications of these two types are still unknown, but pathogenic and prognostic differences have been proposed.[11,12] In some breeds, including IWs, attenuated wavy myofibers have been reported as a consistent and relatively specific histologic finding of DCM.[14,e] However, detailed gross and histopathological studies on hearts of IW with DCM are rare.

Atrial fibrillation is commonly recorded in large breed dogs with DCM or severe atrial enlargement.[1–3] Irish wolfhounds have a particularly high prevalence of AF.[4–6,c,d]

In humans with AF, approximately 70% have underlying organic heart disease, whereas in up to 30% of AF patients, this arrhythmia occurs in the setting of a structurally normal heart or in otherwise healthy individuals.[15] Atrial fibrosis has been described as a principle effect of structural remodeling and contributes to development and persistence of AF.[15–17] Studies using atrial appendage biopsies taken during cardiopulmonary bypass have reported the relationships between atrial histopathology and AF.[18,19] Interstitial fibrosis, vacuolization, and nuclear myocyte derangement included preexisting histologic abnormalities associated with postoperative AF.[18] In a recent study, 74 right atrial appendages (RAAs) and 69 left atrial appendages (LAAs) removed during the Cox-maze procedure used to treat AF were assessed for a relationship between gross and histologic features, and clinical disease recurrence.[20]

Myocyte vacuolization, myocardial fatty infiltration, and myocardial inflammation were noted more frequently in atrial appendages removed from AF patients than in those of control groups without AF.

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