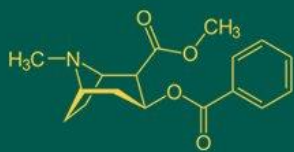


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Electrocardiographic and radiographic findings of pulmonary hypertension due to dilated cardiomyopathy in dogs

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Abstract

The left sided cardiac diseases are one of the common causes of pulmonary hypertension in dogs and various causes including mitral valve disease, myocardial diseases or any left side of heart disease. Dogs with clinical signs suggestive of cardiac diseases were subjected to detailed clinical examination, physical examination and special examination including electrocardiography, radiography and echocardiography. Among 165 dogs screened for cardiac disorders, 61 (36.96%) were diagnosed with DCM out of which, ten (16.39%) had pulmonary arterial hypertension. The predominant electrocardiographic changes noticed in dogs with pulmonary hypertension due to DCM were atrial fibrillation, right axis deviation, bradycardia, *P. pulmonale* and *P. mitrale*. All the ten dogs with pulmonary hypertension due to DCM had interstitial pattern and cardiomegaly, four dogs had dilated pulmonary artery on lateral and ventro-dorsal thoracic radiography.

Keywords: Dilated cardiomyopathy (DCM), Pulmonary Arterial Hypertension (PAH), dogs, echocardiography, electrocardiography, thoracic radiography

Introduction

Pulmonary hypertension (PH) is most commonly diagnosed only in its advanced stage due to its nonspecific clinical signs exhibited in dogs. It is classified as primary and secondary, of which primary PH being idiopathic and uncommon in dogs. The secondary PH develops in dogs with chronic bronchitis, congenital cardiac shunts, degenerative mitral valve disease and left sided congestive heart failure (Chetboul., 2015) ^[1]. Right heart catheterization (invasive method) is the gold standard test for measurement of pulmonary arterial pressure in dogs and human beings. The echocardiographic measurement of systolic pulmonary arterial pressure is a commonly used non-invasive method in dogs for diagnosis of PH. In the absence of tricuspid regurgitation (TR) jet or pulmonic regurgitant flow, the diagnosis mainly relies on clinical signs, thoracic radiography, electrocardiography and pulsed-wave Doppler derived indirect methods such as acceleration time (AT), Acceleration time/Ejection time (AT/ET), notching at deceleration phase of pulmonic flow, right ventricular Tie index and main pulmonary artery/ascending aorta (MPa/Ao) ratio (Venco *et al.*, 2014) ^[5]. In the absence of any one of the above indirect parameters due to technical limitations, the diagnosis would be inconclusive.

However, the electrocardiographic and radiographic findings may provide useful complementary information especially when tricuspid regurgitation (TR) jet is absent or inconsistent.

Materials and Methods

The study was carried out among the dogs (n = 165) presented to the Department of Veterinary Medicine, Veterinary College, Hebbal, Bangalore from November 2019 to July 2021 with clinical signs suggestive of cardiac insufficiency were screened for the DCM with pulmonary hypertension using the specially designed cardiology data sheet. Dogs with clinical signs like dyspnea, cough, exercise intolerance, cardiac cachexia, ascites, limb oedema and murmur on auscultation were screened for the study. They were subjected to detailed clinical examination, physical examination and special examination including electrocardiography, radiography and echocardiography.

The ECG was recorded in right lateral recumbency as per the standard bipolar limb lead system described by Tilley and Smith (2008) [4] using GE Healthcare-MAC-400 portable ECG machine.

Results and Discussion

Among 165 dogs screened for cardiac disorders, 61 (36.96%) were diagnosed with DCM out of which, ten (16.39%) had pulmonary arterial hypertension. The predominant electrocardiographic changes noticed in dogs with pulmonary hypertension due to DCM were atrial fibrillation, right axis deviation, bradycardia, P pulmonale and P mitrale (Fig 3).

Pyle *et al.* (2004) [3] and Kelliham and Stepien (2010) [2] stated that electrocardiographic findings were often normal in dogs with pulmonary hypertension, but findings supportive of a diagnosis of pulmonary hypertension included right axis deviation or other evidence of right heart enlargement. The electrocardiographic findings might also represent changes that had occurred secondary to the underlying disease process (Atrial fibrillation associated with atrial enlargement in dogs with DCM, bradyarrhythmias and atrioventricular blocks associated with increased parasympathetic tone seen in pulmonary disease). In the present study all the ten dogs with pulmonary hypertension due to DCM had interstitial pattern and cardiomegaly, four dogs had dilated pulmonary artery on lateral and ventro-dorsal thoracic radiography (Fig 1 and 2). Kelliham and Stepien (2010) [2] reported that pulmonary hypertension cannot be diagnosed based on thoracic radiographic findings alone, but radiographic findings suggestive or supportive of pulmonary hypertension included right heart enlargement, pulmonary artery enlargement and interstitial or alveolar lung pattern.



Fig 1: Enlargement of right ventricle and dilation of tortuous course of pulmonary artery.

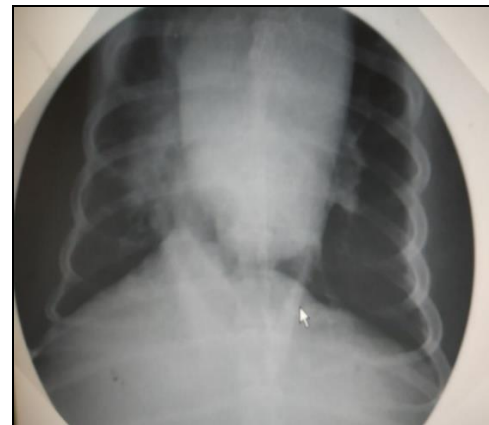


Fig 2: Ventrodorsal radiograph showing bilateral enlargement of cardiac chambers and pulmonary arteries.

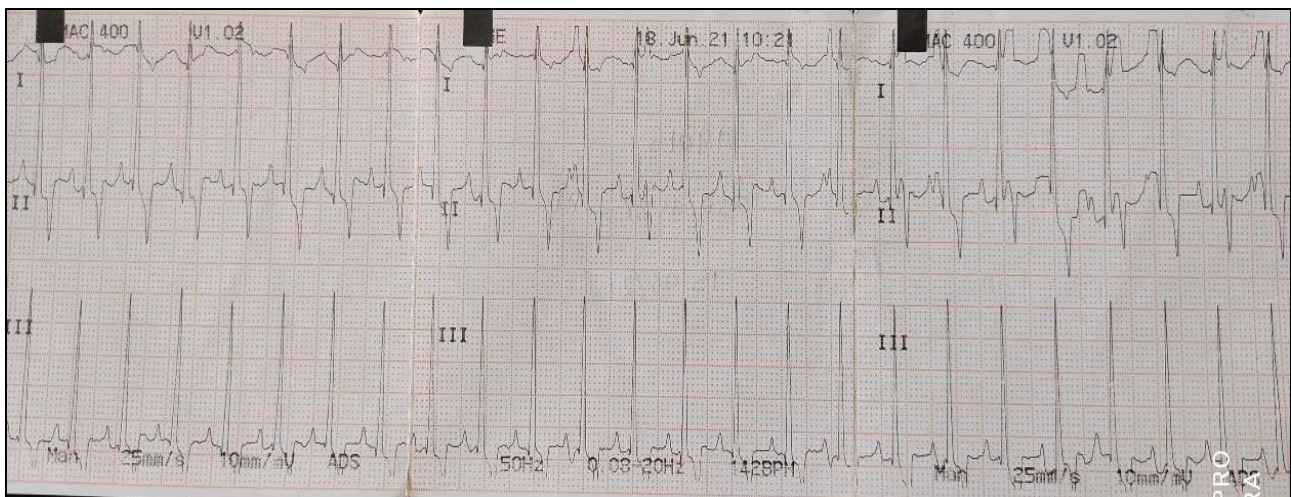


Fig 3: Wide and notching of P wave (P-mitrale) in a dog with DCM and pulmonary hypertension

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