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Clinical assessment of cough in dogs: Identifying cardiac versus non-cardiac origins

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Abstract

Cough has traditionally been linked to cardiogenic pulmonary oedema in dogs, often indicating congestive heart failure (CHF). However, recent findings challenge this assumption. Six dogs of different breeds were presented with primary complaint of chronic cough to the Small Animal Medicine OPD at MSVH, GADVASU, Ludhiana. All showed signs of exercise intolerance and respiratory distress. After thorough physical examination, clinical tests including chest X-rays, electrocardiography (ECG) and echocardiography. Blood work up was normal. X-rays showed increased sternal contact (2.5-3.75 ICS) with no free fluid in the chest. ECG findings included tachycardia (n=4), low voltage complexes (n=4) and absent P wave (n=1). Despite these indications, echocardiography revealed normal cardiac chamber sizes with no regurgitation and normal ejection fraction and fractional shortening. Based on these findings, a cardiac cause of cough was suspected but not confirmed. The study underscores that respiratory and cardiac diseases may co-exist or independently cause cough, and every case of coughing should involve differential diagnosis of both systems.

Keywords: Chronic cough, Congestive heart failure (CHF), Cardiogenic pulmonary oedema

Introduction

In veterinary practice, cough is a significant clinical sign that often reflects an underlying disease process. Cough can be classified in several ways; however, the most clinically useful approaches are based on its duration (acute or chronic) and whether its origin is respiratory or cardiac (Hseih and Beets 2020). During presentation, a thorough general examination can aid in localizing the cause of the cough. The patient should first be observed for respiratory abnormalities and coughing patterns, followed by assessment of vital parameters (Martin and Pereira 2013) [9]. Clinically, a high-normal or elevated body temperature is more commonly associated with primary respiratory disease. In contrast, a low body temperature, particularly in cats, may suggest cardiac disease, as reduced tissue perfusion can lead to hypothermia and contribute to coughing (Lee and Undem 2008) [8]. Coughing is a common clinical sign in dogs with cardiac disease. Cardiac cough” refers to a cough that occurs in association with cardiac disease, although it is not always linked to congestive heart failure. It is important to recognize that cough and heart disease may coexist without being directly related, as the cough could result from another underlying respiratory or systemic condition (Ferasin and Linney 2019) [3]. However, when coughing occurs as a result of heart disease without the presence of congestive heart failure, it can be difficult to distinguish from coughing caused by primary large airway disease (Hseih and Beets 2020). Thoracic radiography is performed first to evaluate the cardiac and respiratory structures. Thoracic ultrasound is recommended for further assessment of abnormal findings detected on radiographs (Ferasin and Linney 2019) [3]. An echocardiogram should be performed when coughing is suspected to be associated with cardiac disease. This diagnostic modality can help identify cardiac abnormalities even in the absence of signs of congestive heart failure.

Materials and Methods

Six dogs of different breeds were presented with chronic cough to the Small Animal Medicine

OPD at MSVH, GADVASU, Ludhiana. All the dogs had a primary complaint of coughing and respiratory distress. All were males of different breeds with age ranging between 1-11 years. The detailed description of breed age and gender has been given in Table 1. Complete physical and clinical examination was performed after making the patients rest for some time. Cardiac auscultation was done between the 3-5th ICS at the point of maximum intensity (PMI). Lung auscultation was performed to detect any abnormal sounds or fluid in the lungs. Blood samples were collected for hematological examination. Further evaluation was done with chest X-rays, ECG and echocardiography. For radiographic examination both lateral and ventro-dorsal view were taken. Electrocardiogram was recorded in all dogs by using BPL cardiart 8108 six channel ECG machine. The patient was placed in right lateral recumbency and limbs were held perpendicular to the body. Limb electrodes were placed either distal or proximal to the elbow (caudal surface) and over the stifle. ECG recording was taken at 50 mm/sec. In present study, 2D and M mode echocardiographic examinations of dogs were carried out using GE Logiq P5 Color Doppler machine using a 5S sector probe. Dogs were consecutively positioned in right lateral recumbency. All echocardiographic measurements were made on conscious dogs (Boon 2011) [2]. From the right parasternal short-axis M-mode view, the following variables were obtained: interventricular septal thickness (IVS), left ventricular internal diameter (LVID), and left ventricular posterior wall thickness (LVPW) in diastole and systole. The following variables were calculated: fractional shortening (FS%) and ejection fraction (EF%).

Results and Discussion

Six dogs of different breeds were presented with chronic cough to the Small Animal Medicine OPD at MSVH, GADVASU, Ludhiana. All the dogs had a primary complaint of coughing and respiratory distress. The causes of coughing in dogs are variable and without a confirmatory diagnosis, the prognosis is poor (Asorey Blazquez *et al* 2025) [1]. Cough and cardiac disease can occur simultaneously but they may not be always associated (Ferasin *et al* 2013) [5]. Some clinicians believe that left atrial enlargement and congestive heart failure alone can directly cause chronic coughing. In contrast, others suggest that coughing usually results from an underlying respiratory disorder that may be worsened by certain cardiac conditions (Asorey Blazquez *et al* 2025) [1]. All the presented animals in this study were males of different breeds with age ranging between 1-11 years. The detailed description of breed age and gender has been given in Table 1. The physical examination parameters were normal with increased respiratory rate at rest (Table 2). Another study that supports this concept revealed that increased respiratory rate is the most reliable independent predictor of CHF in dogs (Schober *et al* 2010) [12]. Upon cardiac auscultation, heart rate was increased, cardiac rhythm was normal with no murmurs heard. Sidhu *et al* (2018) [14] reported tachycardia as one of the major clinical signs in dogs affected with dilated cardiomyopathy along with exercise intolerance. Lung auscultation revealed increased intensity of lung sounds in 4 cases and normal in rest. Mild wheezes were heard in a pug. Abnormal lung sounds can be indicative of any lung pathology, fluid accumulation in thoracic cavity or an underlying cardiac disease (Sidhu 2015) [16]. From the history, physical examination and clinical examination the cases were

presumptively diagnosed for some cardiovascular or respiratory disease. Blood work revealed normal hemoglobin and platelet counts, with total leucocyte counts between 10,000-18,000/cu mm. The cases were further evaluated with chest X-rays, ECG and echocardiography. Lateral views showed increased sternal contact of the heart in 3 cases with no free fluid in the chest, except in one case (Table 3). Radiographs also indicated broncho-interstitial (n=5) and broncho-alveolar patterns (n=1). Free fluid was evident in just one case. In the ventro-dorsal view, the heart was globoid in shape in 2 cases with bulging at a point in another case (Fig 1, 2). The significance of radiography as a tool for diagnosis of cardiac diseases is based on the fact that circulatory imbalances lead to reduced cardiac output in pulmonary or systemic circulation (Sidhu 2015) [16]. Changes in cardiac size are an important indicator of heart disease and can be used to assess the progression and severity of the condition (Hoque *et al* 2019) [6]. Thrall (2007) [17] reported that the unstructured interstitial pattern reflects an early stage of pulmonary involvement during congestive heart failure. Some researchers suggest that the process of obtaining radiographs can exacerbate respiratory distress in a compromised patient. Most of the radiographic findings indicated cardiac enlargement, thereby suggesting a diagnosis more consistent with cardiac disease. Electrocardiogram was recorded in all dogs. The ECG findings were abnormal in all the cases and indicated tachycardia (4 dogs), low voltage complexes (4 dogs), Atrial standstill and absent P wave (1), and altered P wave morphology (1) (Table 3) (Fig 3, 4). ECG is a graphical recording of the heart's electrical activity that is widely used as a non-invasive diagnostic tool for monitoring heart rate (HR), cardiac rhythm and for detecting cardiac abnormalities in dogs (Mukherjee *et al.*, 2015) [10]. The altered ECG findings in this study further emphasized the presence of an underlying cardiac disorder, which could have been the primary cause of coughing in the cases included in this study. Saini (2014) [11] reported most common finding in ECG of DCM cases as P mitrale followed by increased R amplitude, increased QRS duration and deep Q waves. Presence of fluid in the thoracic or abdominal cavity will cause low voltage complexes in an ECG (Sidhu 2018b) [15]. Despite altered ECG findings, 2D and M-mode echocardiography revealed normal cardiac chamber sizes, no mitral or tricuspid regurgitation and normal ejection fraction and fractional shortening. Sidhu *et al* (2018, 2025) [14, 13] reviewed various cardiomyopathies and established normal reference values for M-mode echocardiography in healthy German shepherd dogs, and concluded that it is a valuable diagnostic tool when used in combination with other diagnostic techniques. The values of various M-mode echocardiographic parameters were well within the range as described for healthy dogs of different breeds (Table 4) (Fig 5,6) (Sidhu 2015, Sidhu *et al* 2018) [16, 14]. Based on all clinical, radiographic and echocardiographic findings, it is concluded that, in this study a cardiac cause of cough was suspected but not confirmed. The study underscores that respiratory and cardiac diseases may co-exist or independently cause cough, and every case of coughing should involve differential diagnosis of both systems. Understating the role of cardiac disease in chronic coughing requires further investigation. Significant research and large studies are needed in veterinary and human medicine to close knowledge gaps in our understanding of cough.

Table 1: History and signalment of cases presented with primary complaint of coughing

Cases	Breed	Age	Gender	Primary complaint	Exercise intolerance
1.	N.D	6Y	Male	Coughing	Present
2.	Pug	12Y	Male	Coughing	Present
3.	Golden Retriever	1.6Y	Male	Coughing and Respiratory distress	Present
4.	German Shepherd	4 Y	Male	Coughing and Respiratory distress	Present
5.	N.D	6Y	Male	Coughing and Retching	Present
6.	Pug	11Y	Male	Nocturnal coughing and Respiratory distress	Present

Table 2: Physical examination and vital parameters

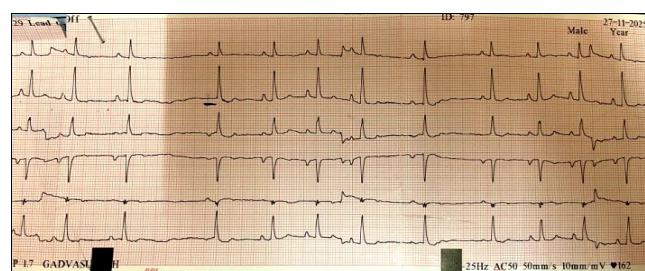
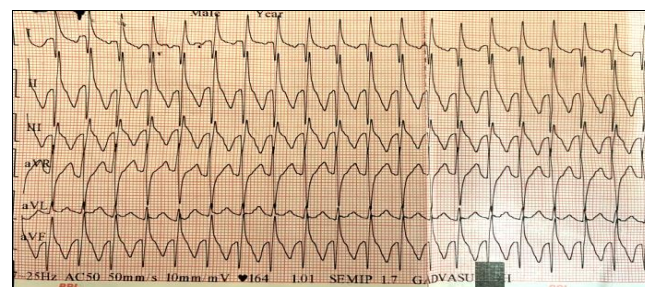
Cases	Breed	Temp	M M	HR	RR
1.	N.D	102.2°F	normal	150 bpm	47 /min
2.	Pug	100°F	normal	144 bpm	45 /min
3.	Golden Retriever	103°F	normal	138 bpm	42 /min
4.	German Shepherd	104.4	normal	92 bpm	47 /min
5.	N.D	102.5	normal	80 bpm	49 /min
6.	Pug	102	normal	120 bpm	51 /min

Table 3: Radiographic findings in lateral and ventro-dorsal view

Case	Breed	Sternal contact	Heart shape	Fluid in chest	Lung pattern
1.	N.D	3.0 ICS	normal	Absent	Broncho-interstitial
2.	Pug	2.5 ICS	Globoid	Present	Broncho-alveolar
3.	Golden Retriever	3.5 ICS	Globoid	Absent	Broncho-interstitial
4.	German Shepherd	3.75 ICS	Bulging at one point	Absent	Broncho-interstitial
5.	N.D	2.75 ICS	normal	Absent	Broncho-interstitial
6.	Pug	3.0 ICS	normal	Absent	Broncho-interstitial

Table 4: M-mode echocardiographic parameters

M-mode parameters	N.D	Pug	Golden Retriever	German Shepherd	N.D	Pug
LVIDd (cm)	3.15	2.99	3.76	3.84	2.85	2.87
LVIDS (cm)	2.03	2.04	2.31	2.46	1.5	1.99
IVSd (cm)	0.98	0.81	1.07	1.29	1.3	0.97
IVSs (cm)	1.06	1.09	1.53	1.33	1.43	1.08
LVPWd (cm)	1.1	1.05	1.18	1.20	1.09	1.23
LVPWs (cm)	1.31	1.21	1.43	1.26	1.28	1.37
FS%	40%	41%	43%	42%	49%	42%
EF%	71%	74%	78%	77%	81%	75%

Radiographic images showing enlargement of heart**Fig 1:** VD thorax showing globoid heart**Fig 2:** Increased sternal contact in lateral view**Electrocardiography showing various changes in coughing cases****Fig 3:** Atrial standstill in a pug (Absence of P waves)**Fig 4:** Ventricular premature complexes in a german shepherd dogs

Echocardiographic findings in the dogs presented with coughing

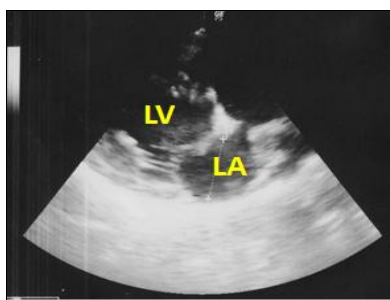


Fig 5: Rt parasternal Long axis view showing normal cardiac chambers

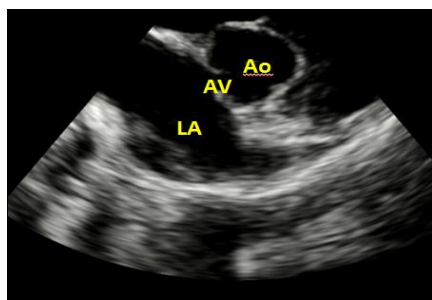


Fig 6: Aortic valve view showing normal size of LA/Ao

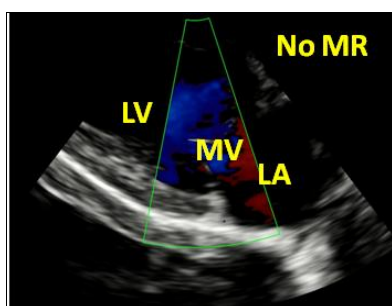


Fig 7: Rt parasternal Long axis view showing normal functioning of MV

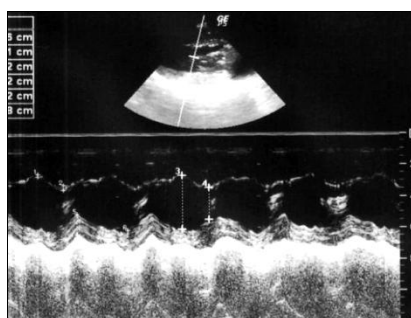


Fig 8: M mode measurement at the level of left ventricle

Conflict of Interest

Not available.

Financial Support

Not available.

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