

*Short Communication***Echocardiographic Assessment of Mitral Valve Insufficiency in Dogs****K. Revathi¹, N. Madhavan Unny^{1*}, Usha Narayana Pillai¹, S. Ajithkumar², R. Uma³ and R. B. Vishnurahav²**

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Abstract

The study was carried out to assess the echocardiographic parameters in dogs with mitral valve insufficiency. Dogs presented to University Veterinary Hospital, Kokkalai and Teaching Veterinary Clinical Complex, Mannuthy with cardiac ailments were screened and eighteen dogs with confirmed mitral valve insufficiency were selected for the study. B -mode, M -mode, colour flow and pulsed wave Doppler examinations were done and compared with that of apparently healthy animals. The left atrium to aorta ratio, ejection fraction, fractional shortening and E point to septal separation values of diseased animals were 1.96 ± 0.14 , 59.33 ± 3.60 per cent, 31.83 ± 2.51 per cent and 5.36 ± 0.50 mm respectively.

Key words: Dog, Echocardiography, Mitral Valve**How to cite:** Revathi, K., Unny, N., Pillai, U., Ajithkumar, S., Uma, R., & Vishnurahav, R. (2019). Echocardiographic Assessment of Mitral Valve Insufficiency in Dogs. International Journal of Livestock Research, 9(11), 217-221. doi: 10.5455/ijlr.20190826014335**Introduction**

Mitral valve insufficiency is the most common cause of heart failure in dogs. The disease is more prevalent in small breeds. and certain breeds like Cavalier King Charles Spaniels and Dachshunds are genetically inherent to this condition (Lewis *et al.*, 2011). Among various diagnostic procedures, echocardiography is considered as the definitive diagnostic tool for diagnosis of mitral insufficiency. According to Thomas (1984), systematic and standardized two-dimensional echocardiographic examination can be used to evaluate canine cardiac anatomy. The transducer locations that provides consistent images in two-dimensional echocardiography are right parasternal, left cranial parasternal and left apical parasternal locations (Thomas *et al.*, 1993). Left atrial enlargement and left atrial- aorta root ratio >1.7 are indicative

of degree of severity and chronic nature of mitral valve degeneration (Borgarelli *et al.*, 2008). Fractional shortening and ejection fraction are often increased in dogs with severe mitral regurgitation (Bonagura and Schober, 2009). Doppler colour flow imaging is broadly used to diagnose and quantify mitral regurgitation in dogs with chronic mitral valve disease (Suh *et al.*, 2016). Pulsed Doppler echocardiography is an accurate and noninvasive technique used to detect disturbed or turbulent flow diagnostic of mitral and aortic regurgitation (Quinones *et al.*, 1980).

Materials and Methods

Dogs brought to the University Veterinary Hospital, Kokkalai and Teaching Veterinary Clinical Complex, Mannuthy were screened for the study. Based on the detailed clinical examination, electrocardiographic, radiographic and echocardiographic studies, mitral valve insufficiency was confirmed. Six apparently healthy adult dogs were taken as control group.

Clinical Examination

Detailed history and results of clinical examination of 18 selected dogs were recorded, giving special attention to the cardiovascular system.

Echocardiography

Echocardiographic examination was performed using Esaote My Lab 30 vet Gold ultra sound scanner with multi frequency cardiac probe. M- Mode, 2D, Colour Flow Doppler and Pulsed Wave Doppler examinations were performed. 2D and M-mode echocardiograms were recorded and analyzed in accordance with the recommendation of the American Society of Echocardiography (Thomas *et al.*, 1993).

Results and Discussion

B- Mode Echocardiographic Assessment

Cardiac and valvular anatomical evaluation was done in all cases. Eight animals of the 18 had thick, irregular and club shaped enlargement of mitral valve (Fig. 1). Severe enlargement of left atrium (Fig. 2) was recorded in four cases. Microscopic structural derangements and macroscopic alterations of the valve leaflets results in incomplete closure. The affected mitral valves appear thick and nodular (Pomerance and Whitney, 1970). Lesions start as isolated nodules and gradually progresses to involve larger areas of leaflets and chordae tendinae. The incomplete closure of valves causes mitral regurgitation and subsequent enlargement of left atrium.



Fig. 1: Club shaped enlargement of leaflet tip – Right parasternal long axis view.
LA -Left atrium, MV- Mitral valve, LV – Left Ventricle, RA – Right Atrium, TV- Tricuspid Valve, RV – Right Ventricle

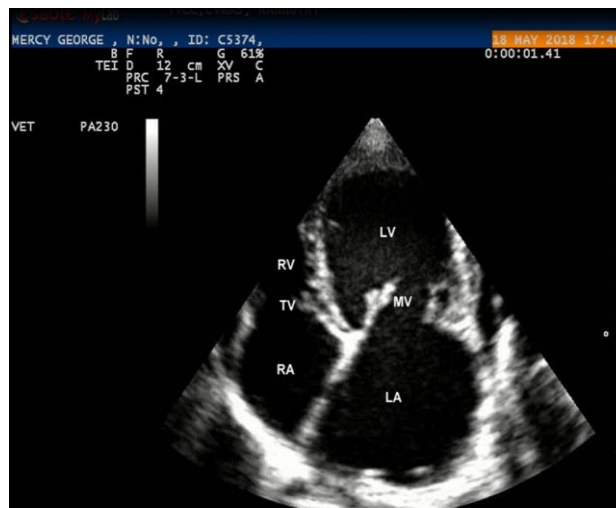


Fig. 2: Enlarged left atrium- Left parasternal apical four chamber view.
LA -Left atrium, MV- Mitral valve, LV – Left Ventricle, RA – Right Atrium, TV- Tricuspid Valve, RV – Right Ventricle

Left Atrial to Aorta Root Ratio (LA/Ao)

Variations were recorded in the LA/Ao of diseased and healthy animals (Table 1). Left atrial to aorta root ratio of diseased animals was significantly high ($p \leq 0.05$) when compared to that of healthy animals (Fig. 3). Left atrial to aorta root ratio assessed from right parasternal long axis view is a commonly used and reliable indicator to confirm the left atrial enlargement (Rishiniw and Erb, 2000). Haemodynamically significant mitral regurgitation causes volume overload which is first indicated by left atrial enlargement.

Table 1: Left atrial to aorta root ratio of diseased and healthy animals

	Left Atrial to Aorta Root Ratio (LA/Ao)	
	(Mean ± S.E)	
Diseased animals	1.96±0.14 ^a	
Healthy animals	1.30±0.02 ^b	
p- value	0.018	

Mean± S.E. bearing different superscripts differ significantly within column ($p \leq 0.05$)



Fig. 3: Increase in left atrium to aorta diameter ratio.
LA -Left atrium, AO – Aorta

M- Mode Echocardiographic Assessment

Left ventricular functions were measured by M-mode echocardiography and presented in Table 2. Left ventricular ejection fraction and fractional shortening are two measurements used to indicate systolic cardiac musculature functions. Here, the EF and FS of diseased animals did not show any variations from that of healthy animals. Both these indices depends on several factors like preload and afterload other than intrinsic myocardial contractility. Hyperkinetic motion of left ventricular wall with increased EF and FS from reduced afterload, combined volume overload and sympathetic activation were characteristic of advancing mitral valvular degeneration as opined by Chetboul and Tissier (2012). Normal values of EF and FS may be present with impaired myocardial function because of the load dependency of the indices (Boon, 2011). This offered explanation for the normal EF and FS in dogs with mitral valve disease.

Table 2: M-mode echocardiographic parameters of diseased and healthy animals

	Ejection Fraction (EF %)	Fractional Shortening (FS %)	E point to Septal Separation (EPSS mm)
Diseased animals	59.33±3.60	31.83±2.51	5.36±0.50
Healthy animals	60.33±2.92	31.5±1.85	5.53±0.10
p- value	0.879	0.942	0.853

E point to septal separation (EPSS) is the shortest distance from E point of mitral valve to ventricular septum and indicates the functional ability of left ventricle. No significant variation was recorded in the EPSS value of diseased and healthy animals. E point to septal separation value of healthy Beagles and German Shepherd Dogs was 3.27mm with minimum and maximum values of 1 and 6 mm (Kirberger, 1991). In the present

study all the recordings were within the normal range. In mitral regurgitation EPSS will be normal or decreased. Elevated EPSS was recorded in dogs with dilated cardiomyopathy (Holler and Wess, 2014).

Colour and Pulsed Wave Doppler Examination

Based on the area occupied by colour jet into the left atrium, assessment of regurgitation as mild, moderate and severe was done as opined by Fuentes (2008). Pulsed Wave Doppler examination also provided information regarding the severity of mitral regurgitation in all cases. It has been suggested that Doppler studies are useful to study the pulmonary regurgitation velocity (Vishnurahav *et al.*, 2017). Positioning of pulsed Doppler gate at different points in left atrium can provide specific details on how wide and deep the jet extends into left atrium. When the gate detects a regurgitant flow, an aliased signal is seen at every point and increased depth and width implies more severe regurgitation (Boon, 2011).

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