CASE REPORT

Diagnosis of Unusual Protruding Type Thrombus on Left Ventricle Free Wall in Labrador Retriever Dogs

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Canine cardiac diseases have an incidence of 10-15 %, out of which the acquired cardiac diseases like valvular diseases and dilated cardiomyopathy (DCM) have most common occurrence. Geriatric male Labrador retriever dogs are most commonly affected from DCM like cardiac disorders (Hoque *et al.,* 2019). Intra-cardiac thrombi and thromboembolism are very unusual in dogs in comparison to the continual complication of cardiomyopathies in cats (Fuentes, 2012). As in humans where left ventricular thrombosis is considered to be a dreadful complication of ischemic heart diseases like myocardial infarction (Nixon, 1983), but, according to Virchow's triad of thrombosis various heart diseases affecting left atrial and ventricle functioning, myocardial contractility pose a higher risk for thrombus formation in dogs (Watson *et al.,* 2009; Usechak *et al.,* 2012). Very few case reports on intra-cardiac thrombi are reported in dogs and only one study reported the presence of thrombus in left ventricle of dogs which was attached to inter-ventricular septum (Caivano *et al.,* 2014). The perusal of the literature revealed that various studies have reported the left ventricular wall thrombosis as a complication of primary heart diseases in humans (Thuny *et al.,* 2006; Ye *et al.,* 2018), but no reports are available in veterinary literature depicting the presence of protruding thrombus on the left ventricle free wall of dogs. So, this is the first report of left ventricular wall thrombosis arising as a complication of concurrent DCM in two Labrador dogs.

Case History and Observations

Case 1: A 4 year old male Labrador retriever weighing 35 kg was brought to Multi-Specialty Veterinary Hospital of Guru Angad Dev Veterinary and Animal Sciences University (GADVASU) Ludhiana, Punjab in North India with history of worsening respiratory distress, exercise intolerance and coughing over last 10 days. Physical examination revealed normal temperature (101.8 °F), slightly pale mucus membrane, weak pulse, dyspnea, muffled heart sounds and tachycardia (166 beats per min) on auscultation. Systolic blood pressure monitored by Doppler method (Vet-dop2, Model BF2, Vmed technology, Mill Creek, USA) was 70 mm Hg depicting hypotension.

Electrocardiography (ECG) done by putting the dog in right lateral recumbency using six channel electrocardiographic machine (Cardiart8108; BPL Medical Technologies, Bangalore, India) depicted absent P waves which were replaced by undulations and normal QRS complexes indicating atrial fibrillation, ST slurring indicating left ventricular enlargement or left bundle branch block and R alternans indicating effusions as well as alternating bundle branch block (Fig. 1A). Heart rate was 176 beats per min, *i.e.* beyond the reference range 70-160 beats per min (Varshney, 2020).

Lateral chest radiographs depicted cardiomegaly (heart was in 3.5 intercoastal spaces with vertebral heart score 10.5), pulmonary edema in caudal lung lobe and lifting of carina (Fig. 1Bb) while, dorso-ventral view revealed pleural effusions (Fig. 1Ba). Haematology indicated neutrophilic leukocytosis with moderate left shift, mild regenerative anaemia with low platelet counts (Table 1).

Bi-dimensional, M-mode, color flow, pulse wave Doppler and continuous wave Doppler was done by using GE Logiq P5 color Doppler ultrasound machine (GE healthcare, Chicago, United States) equipped with 5S transducer. In left apical view it depicted a protruding type of thrombus attached to left ventricle free wall with a fixed base portion and a mobile portion with limited intra-cavitory motion in left ventricle lumen (Fig. 1C). Bi-dimensional echocardiography with pulse wave Doppler gate at mitral valve presented average mitral E to A ratio of 4 which indicates diastolic left ventricular dysfunction and at aortic valve, maximum aortic velocity was 0.85 m s^{-1}. Color Doppler mode indicated moderate mitral regurgitation and continuous wave Doppler over the mitral valve revealed mitral regurgitation jet with maximum velocity 3.80 m s^{-1} (Fig. 1D). M mode echocardiography at right parasternal long axis

view depicted dilated left ventricle and atria, thinning of inter-ventricular septum and left ventricular wall, poor fractional shortening (11.11%) and low ejection fraction (23.68%) indicative of dilated cardiomyopathy (Fig. 1E).

Table 1: Haemato-biochemical parameters of dogs affected with protruding left ventricular wall thrombus with dilated cardiomyopathy (on the day of presentation of cases)

Sr. No.	Parameter	Case-1	Case-2	Reference range (Dabhi *et al.*, 2009)
1.	Haemoglobin (g dL^{-1})	11.3	11.3	12-18
2.	Total leucocyte counts (TLC-cells μL^{-1})	22400	11500	6000-17000
3.	Neutrophils (%)	94	80	60-77
4	Lymphocytes (%)	4	16	12-30
5	Total platelet counts (cells$\times 10^3$ μL^{-1})	195	443	200-500
6	Total erythrocyte count (cells$\times 10^6$ μL^{-1})	4.85	4.74	5.5-8.5
7	Packed cell volume (PCV %)	30.5	30.2	37-55
8	ALT (IU L^{-1})	58	60	8.2-57
9	AST (IU L^{-1})	40	36	8.2-49
10	Total protein (g dL^{-1})	6	5.6	5.4-7.1
11	Albumin (g dL^{-1})	2	2	2.6-3.3

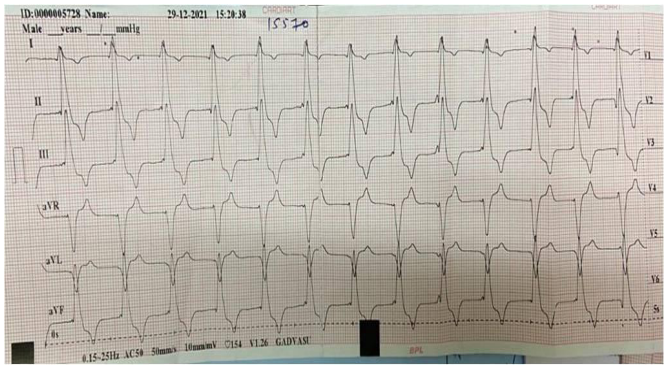

Fig. 1A: Electrocardiogram at 50 mm sec^{-1} velocity and 10 mm mV^{-1} sensitivity depicting absent P waves with tachycardia (176 beats per min) and ST slurring representing atrial fibrillations and left ventricular enlargement.

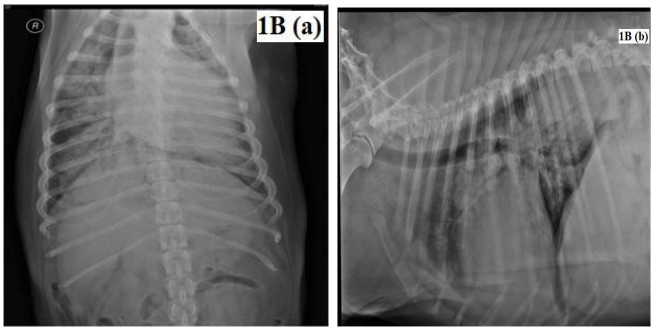

Fig. 1B: Dorso-ventral (a) and Lateral (b) view radiographs of chest depicting cardiomegaly (3.5 ICS), pulmonary edema and mild pleural effusions.

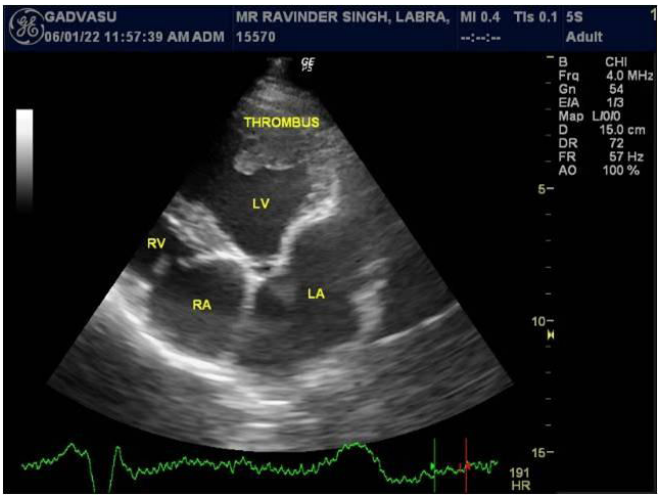

Fig. 1C: Left Apical view depicting protruding type thrombus attached to left ventricle free wall

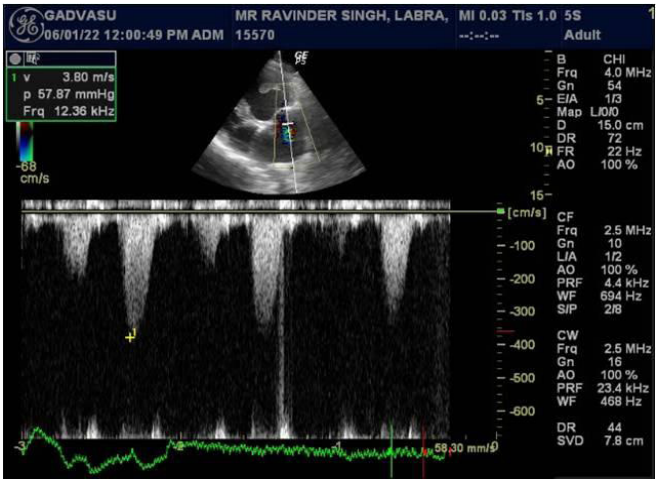

Fig. 1D: Continuous wave and color Doppler mode depicting moderate to severe mitral regurgitation

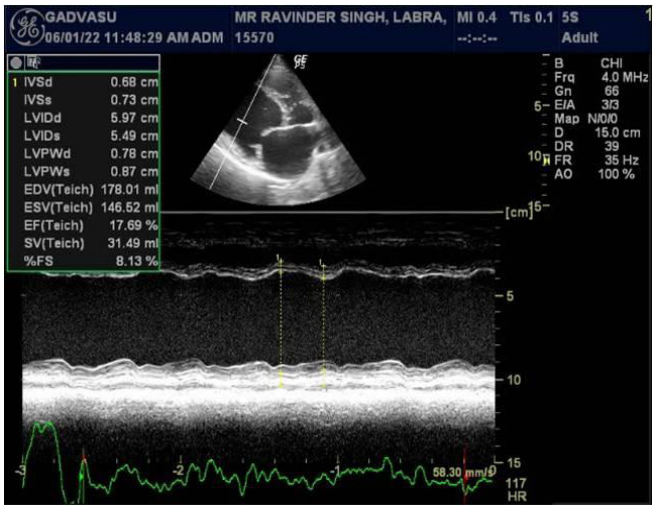

Fig. 1E: M-mode from right parasternal long axis view depicting systolic dysfunction and thinning of inter-ventricular septum and walls.

Case 2: A 14 year old male Labrador retriever dog weighing 38 kg was also presented to Multi-Specialty Veterinary Hospital

of GADVASU, Ludhiana, with the signs of exercise intolerance, nocturnal coughing, respiratory distress and ascites since last 15 days. Physical examination revealed normal parameters including temperature (101 °F) and mucus membrane, except tachycardia (200 beats per min) with gallop sounds on chest auscultation. Systolic blood pressure was 90 mm Hg.

ECG depicted atrial fibrillations with absent P wave (Fig. 2A) and heart rate was 195 beats per min. The chest radiographs revealed cardiomegaly and pulmonary edema with heart occupying 3.5 intercoastal spaces with avertebral heart score of 9 (Fig. 2Ba & 2Bb). Haematology revealed mild anaemia with relative neutrophilia (Table 1). The ascitic fluid was of modified transudate nature with total protein 4.1 g dL^{-1}.

Bi-dimensional echocardiography in left apical four chamber view depicted a protruding type thrombus attached to left ventricle free wall with an attached basal portion with an apical mobile portion with limited intra-cavitory motion in left ventricle lumen (Fig. 2C). Moderate to severe mitral regurgitation with mild tricuspid regurgitation was present on color Doppler (Fig. 2D). M-mode on right parasternal long axis view revealed all the features of DCM that included dilated left ventricle and atria, thinning of inter-ventricular septum and left ventricular wall, increased end point to septal separation (End point to septal separation-1.13 cm), poor fractional shortening (10.87%) and low ejection fraction (23.95%) as shown in Fig. 2E.

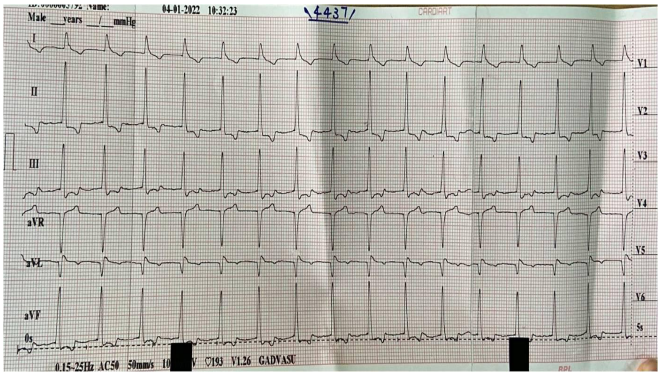

Fig. 2A: Electrocardiogram at 50 mm sec^{-1} velocity and 10 mm mV^{-1} sensitivity depicting absent P waves and tachycardia (195 beats per min).

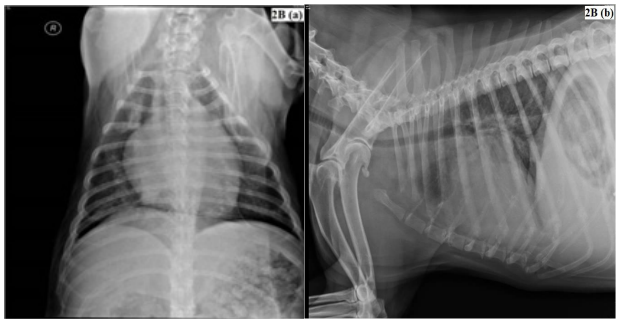

Fig. 2B: Dorso-ventral (a) and lateral (b) view radiographs depicting cardiomegaly (3.5 ICS) and bulge at the 3:00 to 6:00 o´clock representing left ventricular enlargement

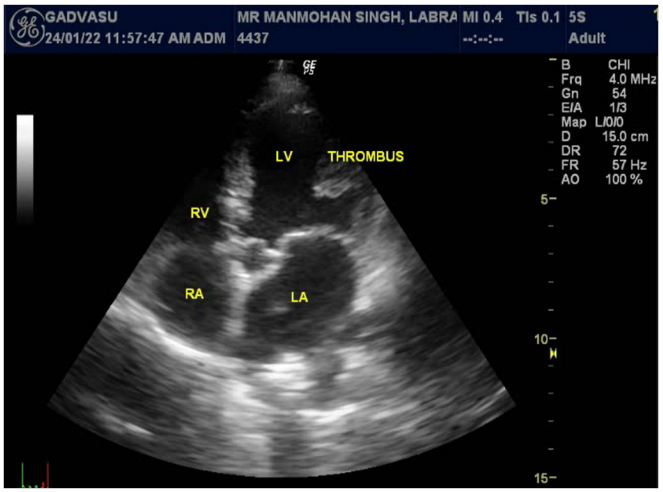

Fig. 2C: Left apical view of heart depicting protruding type thrombus attached to left ventricle free wall.

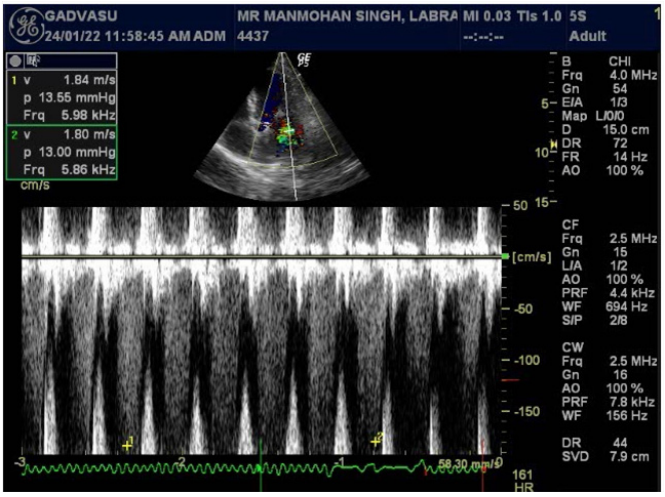

Fig. 2D: Continuous wave and color Doppler mode depicting moderate to severe mitral regurgitations.

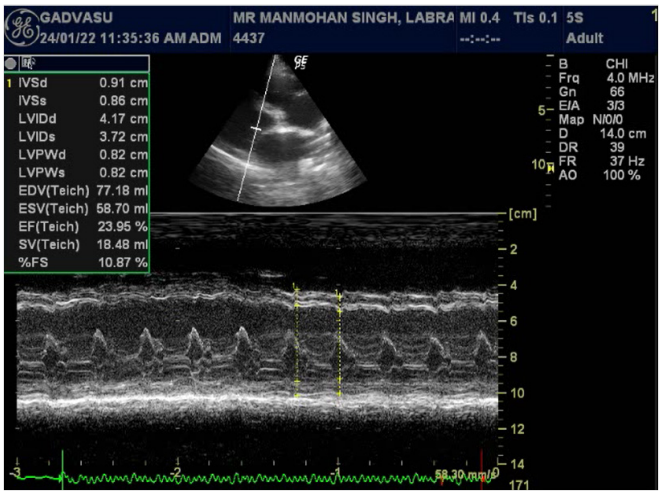

Fig. 2E: M-mode from right parasternal long axis view depicting systolic dysfunction and thinning of inter-ventricular septum and walls.

Treatment and Discussion

Both the dogs were treated with furosemide @ 3 mg kg^{-1} bwt; PO, bid (tablet Lasix®-40 mg, Sanofi Aventis, Nagpur-India), pimobendan @ 0.25 mg kg^{-1} bwt; PO bid (tablet Safeheart®-5 mg, Savavet, Pune-India) , L-carnitine @ 50 mg kg^{-1} bwt; PO bid (tablet Carnisure® - 500 mg, Torrent Pharma, Mehsana-India) for 2 weeks and ampicillin @ 22 mg kg^{-1} bwt; IM bid (injection Roscellin®- 500 mg, Ranbaxy Laboratories Ltd, Gurugram-India) for one week along with oral antiplatelet drugs, aspirin @ 2.2 mg kg^{-1} bwt; PO od and clopidogrel @ 0.2 mg kg^{-1} bwt; PO od combination (Clopivas®-75 mg contain 75 mg aspirin and 75 mg clopidogrel, Cipla, Bangalore-India). The dogs were improving as confirmed on telephonic conversation, but the actual follow-up could not be done due to non-presentation of dog for re-examination.

Intra-cardiac thrombi are a rare complication of cardiomyopathies in dogs. In the present case report, primarily DCM in both the dogs provided the favourable environment in left ventricle as is described in Virchow's triad of thrombosis, which are due to blood stasis, damage to endocardium, changes in blood composition (Watson *et al.,* 2009). Here, in both of the cases, it is speculated that DCM caused endocardial damage and activation of platelets due to blood stasis as is described in human patients especially with atrial fibrillations (Usechak *et al.,* 2012). The mobile and protruding type thrombus could pose a greater risk for embolism suggesting that formation of emboli from the mobile portion of the protruding thrombus can occur (Haugland *et al.,* 1984). Echocardiography is the best tool for diagnosis of intra-cardiac thrombus. But, thrombus needs to be differentially diagnosed from neoplasia and echogenic pattern that develops due to blood stasis. Based on the location and involvement of myocardial dysfunction, tumour was excluded as tumours mostly invade right chambers and the most common of them are hemangiosarcoma and chemodectomas, which arises in right atrium (Mikell *et al.,* 1982; Caivano *et al.,* 2014; Otto and Hopfner, 2020). Also, thrombus was distinguished from dense echogenic pattern due to its acoustically detectable definite echogenic mass (Mikell *et al.,* 1982).

The optimal management of left ventricle thrombus is still controversial even in human medicine (Thuny *et al.,* 2006). The treatment of choice is surgical resection but due to technical deficits, this much advancement is not available in veterinary medicine till now. Even thrombolytic treatment is not successfully experienced in veterinary patients, except cats with aortic thromboembolism and that too with high mortality (Thompson *et al.,* 2001). But, some oral anticoagulants proved to be successful in thrombotic complications like aspirin and clopidogrel which was tried in both the dogs (Otto and Hopfner, 2020). It can be concluded that intra-cardiac thrombi and thromboembolism are very unusual in dogs but their presence must be ruled out in cases of respiratory distress and cardiac affections using echocardiography. Thus, this case report presents the diagnosis of very rare protruding wall thrombus on the free left ventricle walls in two Labrador dogs.

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