

Ascites with right heart failure in a dog: diagnosis and management

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ABSTRACT

A female Labrador dog presented with a history of distended abdomen was subjected for clinical, physical, hemato-biochemical, electrocardiographic, and ultrasonographic evaluations. Respiratory distress, weakness, fluid thrill on palpation of abdomen, cough, cyanotic tongue, and syncope were the significant manifestations. Elevated levels of creatine kinase, lactate dehydrogenase, alanine amino transferase, and alkaline phosphatase with normal blood urea nitrogen and creatinine were the common serum chemistry findings. Low voltage QRS complexes were the electrocardiographic abnormalities. Classical ground glass appearance of abdomen, and enlarged heart with increased sternal contact were the radiographic findings of abdomen and thorax. Ultrasonography of abdomen revealed floating viscera in the anechoic effusion with engorged and distended hepatic vasculature. 2-dimensional echocardiography revealed dilated right ventricle both on B- and M-mode. Further, insufficiency in mitral and tricuspid valves were recorded on pulsed and color flow Doppler. Hence, right heart failure due to ascites was confirmed, and the condition was successfully managed with losartas, spiranolactone, co-enzyme Q10 and tricholine citrate, and sorbitol.

Keywords

Ascites, Co-enzyme Q10, Losartas, Right side heart failure, Spiranolactone

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INTRODUCTION

Multiple organ disorders, hypoproteinemia (Dabas et al., 2011; Turkar et al., 2009), and right side heart failure (Ettinger and Feldman, 2005) are the common causes associated with ascites in dogs. Ascites may indicate a serious underlying condition that requires immediate and rationale treatment, which depends on proper diagnosis. Literatures on ascites in dogs are readily available; however, published reports on its association with right heart failure are dearth in India. The present paper illustrated the diagnosis and management of right heart failure associated ascites and its management in a dog.

CASE HISTORY

An eight years old female Labrador was presented to the Teaching Veterinary Clinical Complex of the College of Veterinary Science, Rajendranagar, Hyderabad, India with the history of persistent distended abdomen for over a period of time. Treatment by local vet did not resolve the problem, except transient relief. History regarding deworming and vaccination were obscure. Further, it was reported that the dog was showing respiratory distress, cough and syncope.

CLINICAL EXAMINATIONS

Close clinical examination revealed severe abdominal distension, respiratory distress, lethargy, cyanotic tongue and coughing. Clinical parameters were found within the normal range. Blood was collected for complete blood profiling, and the serum was prepared



Figure 1. Ultrasonographic image showing anechoic fluid with floating liver

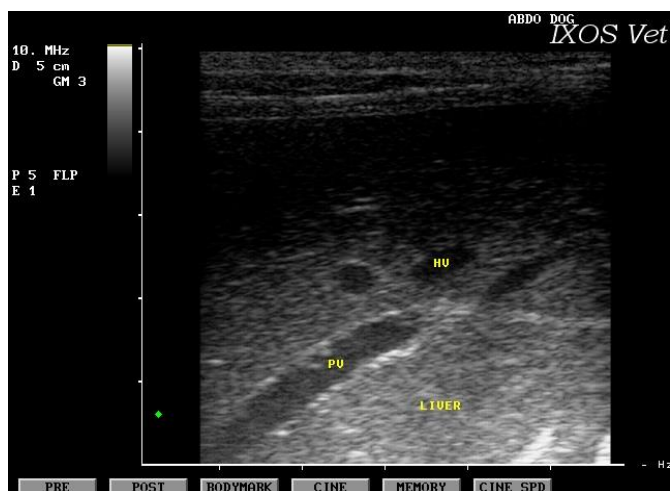


Figure 2. Ultrasonographic image of liver with engorged portal veins (PV) and hepatic veins (HV)



Figure 3. B-mode echocardiogram - note the dilated right ventricle (RV).

for biochemical analysis using commercially available diagnostic kits. Peritoneal fluid was collected aseptically through paracentesis abdominis using sterile disposable syringe after administering dexamethasone at 2 mg/kg body weight, im, to prevent untoward effects such as shock. The aspirated fluid was subjected to physical, cytological and protein analysis by standard methods. Fecal sample was also analyzed to reveal out severity of endoparasitic infestation. Further, the dog was subjected to radiography, electrocardiography, ultrasonography, and 2-dimensional echocardiography. Using color Doppler machine in echocardiography, quantitative dilatation was confirmed comparing with the right ventricle of apparently healthy dog of same age, breed and sex that was maintained at similar managerial practices.

The hemoglobin (Hb; 5.8 g/dL) and total erythrocyte count (TEC; $7.8 \times 10^6/\text{mL}$) were slightly decreased with a normal level of total leukocyte count (TLC; $10.4 \times 10^3/\text{mL}$) and differential leukocyte count (DLC; neutrophil-68, lymphocyte-29, monocyte-01, and eosinophil-02). Moderately decreased level of total protein (4.12 g/dL), albumin (3.04 g/dL) and increased alanine amino transferase (ALT; 78.60 U/L) and alkaline phosphatase (ALP; 128 U/L) were recorded. Also, increased levels of creatine kinase MB (72.4 U/L) and lactate dehydrogenase (LDH; 346.84 U/L) were noticed; these were suggestive for heart failure associated ascites. Low levels of TEC and Hb with eosinophilia could be associated with hook worm infestation, resulting in microcytic hypochromic anemia, as the fecal samples of this dog revealed ova of *Ancylostoma* sp. (+++). The aspirated peritoneal fluid was colorless, transparent, and odorless with a mean protein content of 2.8 g/dL, specific gravity of 1.010 and cellular content of 1350/cmm; these findings suggested the fluid as transudate (Tarn and Lagworth, 2010).

The electrocardiographic findings revealed low voltage QRS complexes, which were suggestive of effusion in body cavities. Abdominal radiograph revealed "ground glass" appearance, which is considered as a classical appearance in ascitic abdomen. Further, gross enlarged heart with increased sternal contact was recorded on thoracic radiograph; this could be attributed to right ventricle enlargement. Abdominal ultrasonography revealed floating viscera in the anechoic abdominal fluid (Figure 1). No abnormal echogenicity was noticed with the abdominal organs such as spleen, kidney and bladder, except liver; where there was presence of hyperechoic to mixed echogenicity indicative for

hepatic disease. Further, the liver was greatly engorged with dilated portal and hepatic veins with hyperechoic focal areas and rounded borders of hepatic lobes (Figure 2); these were suggestive for hepatomegaly associated with congestive heart failure.

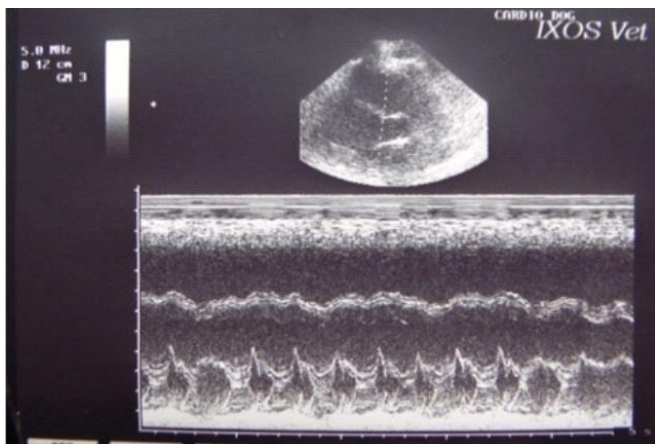


Figure 4. M-mode echocardiogram of RHF dog - note the dilated right ventricle (RV) on par with left ventricle (LV).

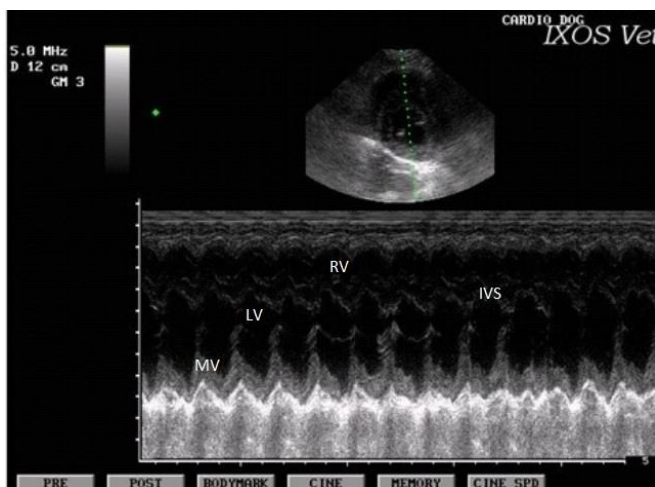


Figure 5. M-mode echocardiogram of healthy dog - note the lumen of right ventricle (RV), left ventricle (LV).

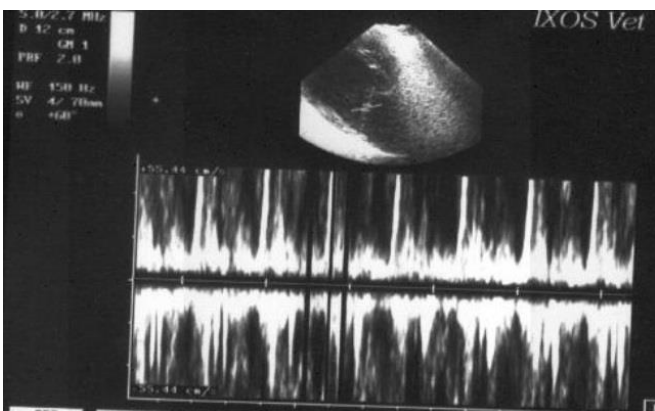


Figure 6. Pulsed wave Doppler image at mitral valve - note the jet like turbulent flow.

2-d echocardiography revealed enlarged and globose heart with dilated right ventricle on right parasternal short axis view on B-mode (Figure 3). Whereas, M-mode showed a relatively increased right ventricle lumen in both diastole and systole condition (Figure 4) as compared to that of healthy dog (Figure 5). Further, pulsed wave and color flow Doppler of the mitral and tricuspid valves revealed jet like turbulent flow (Figure 6) and mosaic pattern of color (Figure 7) respectively; these were suggestive for valvular insufficiency and regurgitation that might be due to pulmonary hypertension and right heart failure.

TREATMENT & MANAGEMENT

Based on the above findings, ascitic dog was diagnosed for hepatic congestion and right side heart failure. The condition was treated with angiotensin receptor blockers (losartas, at 25 mg, sid, 90 days), aldosterone blockers (spiranolactone, at 5 mg/kg, bid, 30 days), syp. sorbiline (tricholine citrate and sorbital) and nutraceutacle (co-enzyme Q-10, 1 tab for 90 days). After 5 days of giving therapy, slight improvement in physical activity, appetite and general health condition observed. Disappearance of abdominal distension and complete clinical recovery were recorded on day 90, no sign of recurrence was noticed within this time.

DISCUSSION

The clinical and hematobiochemical alterations noticed in the present study were in agreement with Tarn and Lapworth (2010). Low voltage QRS complexes with reduced R wave amplitude was considered as significant electrocardiographic abnormality of ascites dogs, as described by Ettinger and Feldman (2005). In many animals with a long history of mitral valve insufficiency, pulmonary hypertension and right side heart failure might be developed. In the cases of mitral valve insufficiency, the right side heart failure might be occurred as secondary due to persistent elevation of left atrial and pulmonary venous pressures. As the wall of right ventricle is thinner and more compliant as compared to the left ventricle, it can be increased in volume; however, this caused a decreased stroke volume.

As a consequence of increased right atrial pressure, ascites, pleural, pericardial effusion, hepatomegaly and splenomegaly might be developed. The common manifestations of right heart failure are respiratory distress, abdominal distension due to ascites, hepato- or splenomegaly (Haggstrom, 2010). The disease process that led to heart failure might not show clinical sign, as in early heart disease, the heart is often able to

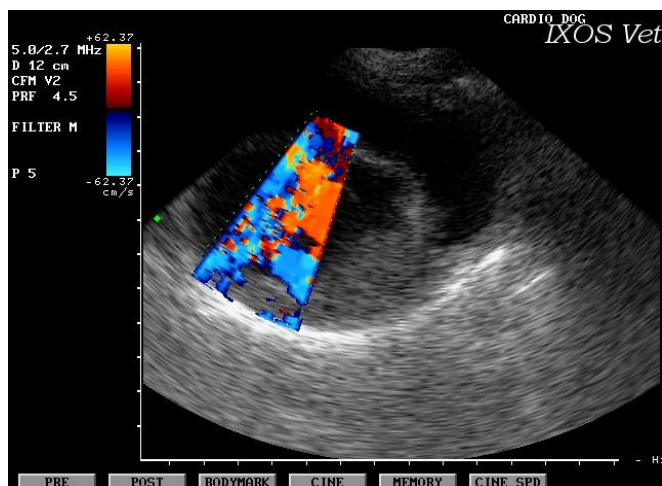


Figure 7. Color Doppler image at mitral valve - note the mosaic pattern of color development.

compensate for changes in volume and pressure. Congestive heart failure (CHF) occurs when the heart is no longer able to compensate. Systemic congestion may result from the impaired blood flow returning to the right heart from the body. Blood backs up and fluid leaks through the vessels into other parts of the body resulting to ascites, pleural and pericardial effusion (Antran et al., 2005).

Signs of right heart failure (abdominal and pleural effusion) might be alleviated with diuretics, and two or more drugs might be used to obtain sequential blocking of nephron (Antran et al., 2005). When pumping efficiently of heart is lessened, fluid retention in the body cavities of dog eventually leads to complete heart failure. Losartan potassium was the first orally bioavailable, long-acting, nonpeptide AT-II type 1-receptor antagonist to be used in humans. The drug is absorbed rapidly from the gastrointestinal tract. Losartan undergoes first-pass hepatic metabolism via cytochrome P-450 (CYP) isoenzymes 2C9 and 3A4 to its active carboxylic acid metabolite (Raquel and Mahtab, 2000). Administration of losartan per day is possible as the drug's effects are extended by the EXP-3174 metabolite and has been found to produce consistent reductions in blood pressure over a 24 h period. The usual starting dosage of losartan potassium is 25-50 mg once daily. However, the dosage should be reduced to 25 mg once daily in the patients having liver function impairment.

Aldosterone receptor blockers (at 0.5 mg/kg) were used in human for the treatment of heart failure, are thought to be effective by blocking the remodeling effects of aldosterone (Borgarelli and Haggstrom, 2010; Atkins et al., 2009). The aldosterone antagonist, spironolactone, has received renewed interest with a

report that survival was prolonged in humans with heart failure when spironolactone (0.3 mg/kg QD) was administered concurrently with conventional therapy in NYHA phase IV patients (Clarke, 2007).

Co-enzyme Q10, also known as ubiquinone, is essential for energy production at the cellular level. It helps the body to produce energy by two ways; one: by helping cell to produce enzymes that is used to generate energy, and two: by creating energy directly. In the cases of insufficient coenzyme Q10, heart could be weakening leading to malfunction of heart due to inadequate blood circulation. In older animals, this is especially critical as production of coenzyme Q10 drops with the advancement of age (Harker et al., 2000).

CONCLUSIONS

Right side CHF could be one of the probable causes for ascites in dogs (as the condition is manifested by pleural, pericardial and abdominal effusion) that requires special attention and the suspicion never be ignored. Aldosterone blockers (diuretics) along with angiotensin receptor blockers, cardiac neutraceuticals and hepatoprotectives can be considered as effective therapeutic agents to treat right heart failure in dog.

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