

## ULTRASONOGRAPHIC ASSESSMENT OF ASCITES AND SEPTIC PERITONITIS IN SIX DOGS

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### SUMMARY

Six dogs were brought to the clinic with the history of continuous abdominal enlargement, vomiting, constipation and dysuria for the last 10 to 30 days. On abdominocentesis, there was aspirated out of serous type fluid in three cases and purulent material from remaining three cases. Ultrasonograph of ascitic dogs revealed accumulation of anechoic fluid in the abdominal cavity. The liver parenchyma was hypoechoic and thick walled with prominent hepatic vasculature. Ultrasonograph of dogs with septic peritonitis revealed multiple echogenic granules of purulent material in the abdominal cavity. The liver parenchyma showed loss of detail between different lobes of the liver due to degenerative changes. On haematological findings, anemia and leukocytosis along with neutrophilia was observed. On biochemical profile, low level of proteinaemia, albuminaemia, serum glucose level and elevated activity of SGOT and SGPT was observed in both ascitic and septic peritonitis dogs. On treatment the ascitic dogs responded well and become completely cure in comparison to the dogs with septic peritonitis. It can be concluded that ultrasonography is a useful technique to assess and differentiate cases of ascites and septic peritonitis in dogs.

**Keywords:** Abdominocentesis, Ascites, Canine, Peritonitis, Ultrasonography

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The cases of abdominal enlargement are routinely observed in canines. There are multiple causes of abdominal enlargement but the main cause of enlargement is accumulation of fluid which ultimately results in ascites. Ascites is a symptom or clinical sign that develops as a result of other underlying illnesses rather than a disease. These conditions include multiple organ disorders, hypoproteinemia (Pradhan *et al.*, 2008; Padhi *et al.*, 2022), nephrotic syndrome, congestive heart failure, chronic hepatic failure, malnutrition, ancylostomiasis and protein-losing enteropathy (Turkar *et al.*, 2009) in dogs. Abdominocentesis and other imaging methods can be used to assess the amount of fluid accumulation in the abdominal cavity. It is common to find serous-type fluid in the abdominal cavity, but it is uncommon to find purulent material in a dog's belly. Six canine cases of abdominal enlargement were analyzed and distinguished in the current report using abdominocentesis and ultrasonography.

The study was conducted on six dogs of different breed, age and sex (Table 1) brought to the VCC, LUVAS, Rohtak, Haryana with the history of continuous abdominal enlargement, vomiting, constipation and dysuria for the last 10 to 30 days. There was continuous reduction in intake of food and water. Local veterinarian tried to treat the cases by routine treatment but could not gain much improvement. On examination, the conjunctiva and mucous membrane of the gum was congested in three dogs. There was sign of ataxia in these dogs and they preferred to lie down instead

of standing and walking. These cases were suspected either for ascites/rupture of urinary bladder. On abdominocentesis from the caudal portion of the abdomen, there was oozing of serous type of fluid in three cases confirming these cases to be cases of hydroabdominus or ascites. Abdominocentesis in remaining three cases revealed accumulation of pus in the abdominal cavity confirming these cases to be cases of septic peritonitis (Fig. 1). Grouping of these dogs has been done on the basis of presence of ascites or septic peritonitis i.e. group I contain 3 dogs possess ascitic condition while group II also contain 3 dogs possess septic peritonitis conditions (Table 1).

### ULTRASONOGRAPHIC ASSESSMENT

Ultrasonogram in cases of ascites i.e. 1<sup>st</sup> group revealed accumulation of anechoic fluid in the abdominal cavity. Ultrasonography of the liver was performed in dorsal or lateral recumbency using 3-12 MHz frequencies. A linear array transducer was placed on various topographical locations of the respective organ. The organ was scanned in both transverse and longitudinal sections, with the transducer moved gently from cranial to caudal and from right to left. The hypoechoic lobes of the liver could be seen floating in the anechoic fluid of abdominal cavity. Acoustic enhancement of abdominal wall can be appreciable due to change in acoustic interface. The echogenic capsule of the liver was prominent. The gall bladder was distended and full of anechoic bile due to less food intake. The liver parenchyma was hypoechoic and thick-walled hepatic

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Fig. 1. Abdominocentesis in cases of septic peritonitis

vasculature was seen due to inflammatory response (Fig. 2). The ultrasonograph of septic peritonitis i.e. group-II showed that the fluid in abdominal cavity was denser as compared to group I because of presence of pus in the abdominal cavity. Multiple echogenic granules of purulent material were visible in the abdominal cavity. The ultrasonograph of the liver showed that the liver capsule was irregular and thick due to sepsis. The liver parenchyma was dense with increase of echogenicity. There was loss of detail between different lobes of the liver due to degenerative changes. The wall of the gall bladder was thick and hyperechoic (Fig. 3).

#### CLINICAL AND LABORATORY FINDINGS

On physiological examination in group-I ascitic dogs, the body temperature ( $102.83 \pm 0.20$ ), respiratory rate ( $101.33 \pm 2.33$ ) and heart rate ( $34.67 \pm 2.85$ ) were recorded higher in comparison to the group-II septic peritonitis dogs which was  $101.17 \pm 0.44$ ,  $85.33 \pm 2.60$  and  $24.33 \pm 1.20$ , respectively. The haematobiochemical findings of these dogs (both group) were observed and recorded (Table 2). The hematological report in group-I ascitic dogs revealed low hemoglobin content ( $8.66 \pm 0.14$  g/dl) along with slight leukocytosis ( $27.38 \pm 0.84$  thousand/ $\text{mm}^3$ ) and neutrophilia ( $80.62 \pm 1.28\%$ ) condition; whereas in group-II septic peritonitis dogs' hemoglobin content ( $6.64 \pm 0.18$  gm/dl) is much lesser in comparison to group-I ascitis dogs along with more leukocytosis ( $42.67 \pm 1.62$  thousand/ $\text{mm}^3$ ) and neutrophilic ( $91.87 \pm 0.86\%$ ) condition. On serum biochemical findings, in group-I ascitic dogs, there was decrease in total protein ( $4.85 \pm 0.01$  g/dl), serum albumin ( $1.56 \pm 0.01$  g/dl) and serum glucose ( $69.92 \pm 1.15$  mg/dl) was reported; however slightly elevated AST ( $97.34 \pm 0.64$  IU/L) and ALT ( $137.64 \pm 4.75$  IU/L) enzymatic activity was observed. However; in



Fig. 2. Ultrasonography of liver in Ascites showing distended gall bladder, hypoechoic liver parenchyma and thick-walled hepatic vasculature



Fig. 3. Ultrasonography of liver in septic peritonitis showing denser fluid in the abdominal cavity, irregular and thick liver capsule, dense liver parenchyma with increase echogenicity

II group low glucose ( $58.12 \pm 0.77$  mg/dl) level along with decrease in total protein ( $4.69 \pm 0.05$  g/dl) and serum albumin ( $1.48 \pm 0.02$  g/dl) level in pre-treatment phase was recorded. AST ( $95.43 \pm 0.54$  IU/L) and ALT ( $133.88 \pm 1.57$  IU/L) values were also found elevated than the normal in this group.

#### TREATMENT

On cultural examination of purulent material from group-II showed mixed infection of *Staphylococcus* and *Corynebacterium* which was found sensitive to Chloramphenicol, Amikacin and Ceftizoxime. The line of treatment in group-I of ascitis dogs included: Pheneramine maleate

**Table 1. Differentiation of dogs on the basis of breed, age, sex and ascitic/septic peritonitis condition.**

Group No.	Breed	Age	Sex	Ascitic/septic peritonitis
1.	Labrador Retriever	3.5 yr	Female	Ascitic
	Doberman	5.6 yr	Male	Ascitic
	Non-descript	3 yr	Male	Ascitic
2.	Labrador Retriever	4 yr	Male	Septic peritonitis
	German Shepherd	2.5 yr	Male	Septic peritonitis
	Non-descript	3.2 yr	Female	Septic peritonitis

**Table 2. Haemato-biochemical profiling in ascitic (Group-I) and septic peritonitis dogs (Group-II)**

Parameters	Group-I (Mean±SE)	Group-II (Mean±SE)
Temperature (°F)	102.83±0.20	101.17±0.44
Pulse (beats/min)	101.33±2.33	85.33±2.60
Respiration (beats/min)	34.67±2.85	24.33±1.20
Hb (g/dl)	8.66±0.14	6.64±0.18
TLC (thousands/mm <sup>3</sup> )	27.38±0.84	42.67±1.62
Neutrophil (%)	80.62±1.28	91.87±0.86
Total Protein (g/dl)	4.85±0.01	4.69±0.05
Serum Albumin (g/dl)	1.56±0.01	1.48±0.02
AST (IU/L)	97.34±0.64	95.43±0.54
ALT (IU/L)	137.64±4.75	133.88±1.57
Serum glucose (mg/dl)	69.92±1.15	58.12±0.77

@ 0.5 mg/kg b.wt IM- For quick relief from allergic manifestations for 5 days, Ceftizoxime @ 20 mg/kg b.wt IV- to control the secondary bacterial complication along with Amikacin @ 10 mg/kg b.wt IV BID for 10 days, Vitamin C @ 25 mg/kg b.wt IM for 15 days, Frusemide (Lasix) @ 2-4 mg/kg b.wt IV BID for 7 days, Liver tonic (Liverolin P.O.) @ 10 ml P.O for 20 days, hepamerz @ 10 ml P.O. for 10 days and high protein diet for 20 days. The line of treatment in group-II of septic peritonitis included: Pheneramine maleate @ 0.5 mg/kg b.wt IM for 5 days, Ceftizoxime @ 20 mg/kg b.wt IV with Amikacin @ 10 mg/kg b.wt IV BID for 10 days, metronidazole @ 5 mg/kg b.wt IV, Vitamin C @ 25 mg/kg b.wt IM for 15 days and Cyanocobalamine @ 1.5 ml IM for 5 days, Peritoneal lavage with povidone-iodine. The treatment was advised for 10 days. For this firstly placed the animal in lateral recumbency and prepare a 10×10 cm skin area on the ventral abdominal midline centered over the umbilicus aseptically. Then gently insert the catheter into the peritoneal cavity caudal to the umbilicus in the dependent portion of the ventral abdominal wall and direct it caudally toward pelvis. Withdraw the styled and if fluid flows freely, collect it in sterile tubes for analysis. Ascitic dogs of the group-I responded well to the treatment after 10 days and they took 20- 30 days for complete cure; however, group-II i.e. septic peritonitis dogs responded less to the given specific

treatment even after 10 days.

In the present study also, ascites got developed due to involvement of the liver as indicated by ultrasonography. The liver parenchyma was hypoechoic and thick walled and hepatic vasculature was very prominent which can be seen in only inflammatory response. It is usually observed that infection to the abdominal cavity get transferred from gastrointestinal tract either by leakage of the contents or without leakage (Martiny and Goggs, 2019). Accumulation of purulent material in abdominal cavity is a very fetal condition in canine. This condition can be differentiated from other conditions by abdominocentesis and by different imaging techniques. Paracentesis is a routine technique to judge abdominal cavity contents (Crowe, 1984) but ultrasonography was observed to be a useful technique to assess and differentiate cases of ascites and septic peritonitis in dogs. In the present study presence of multiple echogenic granules of purulent material in abdominal cavity, irregular and thick liver capsule, dense parenchyma and loss of detail between different lobes of the liver due to degenerative changes are the differentiating features of septic peritonitis. Leukocytosis, anemia, neutrophilia along with the low level of proteinaemia, albuminaemia and serum glucose level on haemato-biochemical findings indicated the purulent bacterial infection which leads to ascites and septic peritonitis. Low level of Hb, hypoproteinaemia, hypoalbuminaemia along with increased liver enzymes was also reported earlier (Mittal *et al.*, 2024; Chaturvedi *et al.*, 2013). The significant changes observed during ultrasonographic technique along with the haematobiochemical profiling might be plays a crucial role to differentiate ascites from septic peritonitis.

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