



*Original Research*

## Ultrasonographic Diagnosis of Biliary Tract Disorders in Dogs

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### Abstract

*Ultrasonography is an important diagnostic technique used to examine most structures in small animal abdomen providing a rapid non-invasive means of diagnosis. In this study, out of 140 dogs diagnosed for hepatobiliary disorders, 52 dogs were diagnosed ultrasonographically with biliary tract disorders. Sonographically, these biliary tract disorders were classified as distended gall bladder, cholecystitis, gall bladder sludge, cholelithiasis and gall bladder among the 52 affected dogs.*

**Key words:** Biliary Tract Disorders, Dogs, Ultrasonography

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### Introduction

Hepatobiliary dysfunctions occur in a number of acute and chronic clinical conditions. Drug-induced hepatotoxicity, infectious diseases, congenital or neoplastic diseases, metabolic disorders, degenerative processes, vascular injury, auto-immune diseases and even blunt trauma (Kumar *et al.*, 2013). Abdominal ultrasonography is the most commonly used imaging modality for small animals with suspected hepatobiliary diseases (Lidburg and Steiner, 2013). Ultrasound can be used to examine the structure of liver parenchyma, bile duct system, hepatic and portal veins, and pathological changes in the liver and gall bladder in dogs (Wigger *et al.*, 2009). Diagnostic imaging of biliary tract disorders is an important part of the investigation, which results in specific diagnosis and provides reliable prognostic information



Ultrasonographic appearance of normal gall bladder is anechoic, round to oval structure with smooth margins located within the liver. The size of the gall bladder varies with fasting or feeding condition of the dogs (Jonathan and Steiner, 2013). Generalized gall bladder wall thickening can occur with cholecystitis, cholangiohepatitis, and the wall may appear to have double layer. Choleliths can occur more commonly in dogs and appear as hyperechoic structures of variable size number and shape that produce acoustic shadowing. Gall bladder mucoceles are an important cause of icterus and obstructive disease (Geschen, 2009).

### Materials and Methods

Dogs presented to Veterinary Hospital, Bhoiguda with the clinical signs of anorexia, jaundice, vomiting, lethargy, or other manifestations suggestive of biliary disorders were selected. Ultrasonography of abdomen was performed in real time B-mode using *IXOS vet* ultrasound machine supplied by Esoate Pie Medicals, Netherlands with L10-5 MHz linear array or C5-2 R13 micro convex array transducers in transverse and Saggital planes as per the standard protocol described by Nyland *et al.* (2002). Starvation prior to the examination was must as gas and food material in the stomach is a barrier to successful ultrasound. The abdomen was clipped from the xiphisternum caudally, but in deep chested dogs, hair was clipped onto the sides especially over the rib cage. Gall bladder was examined in right transverse oblique and left transverse oblique positions of transducer and it was evaluated for its size, shape, contents and wall thickness. The images were frozen and recorded on thermal printing paper using Sony printer.

### Result and Discussion

Out of 140 dogs diagnosed for hepatobiliary disorders, 52 dogs were affected with biliary tract disorders. Distended gall bladder, cholecystitis, gall bladder sludge, cholelithiasis and gall bladder mucocele were the ultrasonographic changes noticed in dogs. Ultrasonographic changes in 14 (26.92%) dogs with gall bladder distension revealed an increase in the gall bladder size with anechoic bile (Fig. 1).



**Fig.1:** Abdominal ultrasound scan showing distended gall bladder with anechoic bile

Ultrasonographic changes in 17 (32.69%), dogs with cholecystitis revealed a normal echogenicity of hepatic parenchyma with symmetrically thickened gall bladder wall along with anechoic bile was seen in all cases (Fig. 2).



**Fig. 2:** Abdominal ultrasound scan showing thickening of gall bladder wall suggestive of cholecystitis

In few dogs double layered hyper echogenic wall of the gall bladder was also noticed (Fig. 3). These observations were in agreement with Chaudhary *et al.* (2008), who diagnosed cholecystitis on the basis of thickening of gall bladder wall more than 3.5 mm.



**Fig. 3:** Abdominal ultrasound scan showing double layered hyperechoic gall bladder wall suggestive of Cholecystitis

Thickened gall bladder wall appeared as hyperechoic region due to visualization of both inner and outer layers, with the presence of abdominal fluid or peripheral margin of oedema in inflammatory conditions (Nyland and Hager, 1985). Normally the gall bladder wall is not visualized or poorly visualized. But when there is inflammation of the gall bladder, the wall becomes thickened that can be recorded as hyperechoic thick structure and sometimes as a double rim effect when there is edema (Aissi and Slimani, 2009). Ultrasonographic changes in 12 (23.08%), dogs with gall bladder sludge revealed sediment in the gall bladder of moderate echogenicity and gravity dependent, which moved freely within the lumen of the gall

bladder (Fig. 4). These findings were in agreement with Voros *et al.*, 2008, who reported that, mild degree of inflammation or biliary stasis was conjectured to be associated with gall bladder sludge.



**Fig. 4:** Abdominal ultrasound scan showing gall bladder sludge

Ultrasonographic changes in 8 (15.38%) dogs with cholelithiasis revealed choleliths in the gall bladder, which were hyper echoic, gravity dependent with acoustic shadow (Fig. 5), while few choleliths did not produce acoustic shadow. Choleliths, a concentration of cholesterol, calcium and bilirubin are uncommon in dogs and are asymptomatic in many cases. They appear as round or irregular hyper echoic structures with distal shadowing (Seiler, 2013).



**Fig.5:** Abdominal ultrasound scan showing Cholelithiasis with gravity dependent choleliths and acoustic shadowing.

Ultrasonographic changes in 1 (1.93%) dog with gall bladder mucocele revealed hyper echoic striations radiating from the central point gave an appearance of kiwi fruit pattern (Fig. 6). These findings were in agreement with Seiler, 2013 who reported that mucinous gland hyperplasia and inspissated bile can lead to

the formation of biliary mucoceles, which appear as enlarged gall bladder filled with immobile bile in a stellate, striated or mixed pattern (Table 1).



**Fig.6:** Abdominal ultrasound scan showing kiwi fruit pattern suggestive of gall bladder mucocele

**Table 1:** Ultrasonographic changes of biliary tract disorders in dogs

S. No.	Ultrasonographic Changes	Number of Dogs	Percentage (%)
1	Cholecystitis	17	32.69
2	Distended gall bladder	14	26.92
3	Gall bladder sludge	12	23.08
4	Cholilithiasis	8	15.38
5	Gall bladder mucocele	1	1.93

### Conclusion

Ultrasound findings among 52 dogs affected with biliary disorders were gall bladder distension, biliary sludge, cholecystitis, cholilithiasis and gall bladder mucocele.

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