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Ultrasonographic Evaluation of Hepatic Disorders in Dogs

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ABSTRACT

Abdominal ultrasonography is the most commonly used imaging modality for small animals with suspected hepatobiliary diseases. In the present study, 140 cases were subjected to ultrasonographic examination, of which 32 cases were diagnosed as diffuse parenchymal disorders with ascites, 32 as diffuse parenchymal disorders without ascites and 24 as focal parenchymal disorders. Out of 32 cases of diffuse parenchymal disorders with ascites, liver size were normal and reduced with varied echogenic pattern viz., diffuse hyper and mixed echogenecity. The liver margins were rounded and irregular with normal and inapparent portal and hepatic veins. The echo-texture was coarse and hetero genous along with hypoechoic masses. Ascites (peritoneal fluid) represented by anechoic fluid were present in all 32 dogs. Out of 32 dogs of diffuse parenchymal disorders without ascites, liver size were normal and enlarged with diffuse hyper, hypo and mixed echogenecity. The liver margins were sharp and rounded in with normal, dilated and in apparent portal and hepatic veins. The echo texture was coarse and heterogenous with hypo echoic masses. Out of 24 dogs of focal parenchymal disorders, liver size were normal and enlarged with hypo and mixed echogenecity. The liver margins were sharp, rounded and irregular along with normal, dilated and in apparent portal and hepatic veins. The echo texture was coarse and heterogeneous along with hypo and hyper echoic masses were seen. Ascites (peritoneal fluid) represented by anechoic fluid.

HIGHLIGHTS

- Ultrasonography is a non-invasive method used for the dogs to diagnose various hepatobiliary disorders.
- The echogenecity, echo texture liver size and liver margins were evaluated and compared with the healthy control dogs.

Keywords: Hepatic disorders, Dogs, Ultrasonography, Diagnosis

Abdominal ultrasonography is the most commonly used imaging modality for small animals with suspected hepatobiliary diseases. It allows assessment of hepatic parenchyma and biliary tract. A wide variety of disease processes can cause diffuse changes to hepatic parenchyma. (Lidburg and Steiner, 2013). Ultrasonography aids in distinguishing different types of generalized liver diffuse parenchymal diseases resulting in either hyper echogenecity or hypoechogenicity changes of liver echo texture in comparison to normal spleen and kidney echogenecity (Boroffka, 2015). Ultrasonography can provide information about the hepatic parenchyma's size, shape, echogenicity, echo texture, and details of the biliary system (Webster *et al*., 2019). An increased echogenicity (hyper echogenic) of liver parenchyma and dilatation in vascularity of hepatic and portal veins in dogs are suggestive of hepatic cirrhosis. (Elhiblu *et al.,* 2015). A small irregular liver margins is indicative of chronic liver disease viz., cirrhosis and fibrosis. Decreased hepatic echogenecity with distended hepatic veins is commonly seen in hepatic congestion. Hepatomegaly was characterized by large volume between diaphragm and stomach with rounded caudal ventral edges (Seiler, 2013).

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MATERIALS AND METHODS

Dogs presented to Veterinary Hospital, Bhoiguda with the clinical signs of anorexia, jaundice, vomition, 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.

Liver was examined fully in both transverse and longitudinal sections by placing the transducer (3.5- 10 MHz) in the sub xiphoid position and angling the beam cranio dorsally in a mid saggital plane. Then it was scanned by sweeping the beam in an arc from left to the right through entire liver. The beam was angled dorsally or ventrally in successive sweeps to make sure the entire liver is imaged. Liver was also imaged through an intercoastal approach through 10^{th} to 12^{th} left and right inter-coastal spaces especially in deep chested dogs. Liver was evaluated for size, shape, echogenicity (decreased / increased / mixed) and also hepatic parenchymal abnormalities (diffuse/focal).

RESULTS AND DISCUSSION

Out of 140 dogs that were suspected for hepatobiliary disorders, were subjected to ultrasonographic examination, 32 were diagnosed as diffuse parenchymal disorders with ascites, 32 as diffuse parenchymal disorders without ascites, 24 as focal parenchymal disorders and 52 as biliary tract disorders. Hepatic parenchyma of healthy control dogs had uniform level of echogenecity with evidence of portal and hepatic veins. Liver appeared coarse in echo texture and less echogenic than spleen and hyperechoic or isoechoic compared to the adjacent right kidney. Portal veins had echogenic walls, while hepatic veins lacked these echogenic walls. The gall bladder was pear shaped anechoic structure located between quadrate and right medial lobes of the liver (Fig. 1-2).

Out of 32 dogs of diffuse parenchymal disorders with ascites, liver size was normal in 6 dogs (18.75%) and reduced in 26 (81.25%). The echogenic pattern revealed diffuse hyper echogenecity in 31 (96.88%) and mixed echogenecity in 1 (3.12%). The liver margins were rounded in 3 (9.38%) and irregular in 29 (90.62%). Portal and hepatic veins were normal in 2 (6.25%) and inapparent in 30 (93.75%).

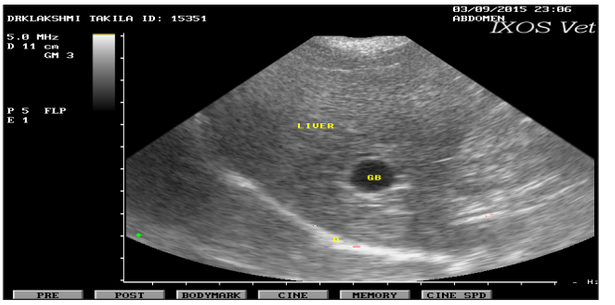

Fig. 1: Ultrasonogram of liver in a healthy dog- liver iso echoic to falciform fat and presence of anechoic gall bladder.

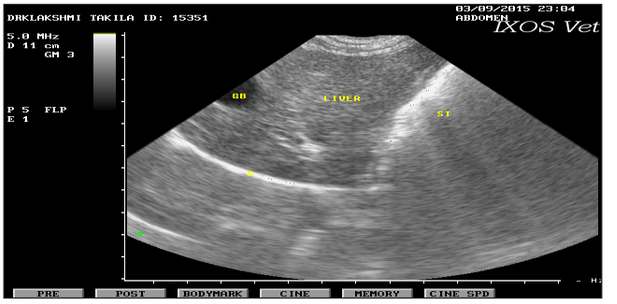

Fig. 2: Ultra sonogram of liver in a healthy dog-hepatic parenchyma was hypo echoic than spleen

The echo texture was coarse in 8 (25%) and heterogenous in 24 (75%). Hypo echoic masses were seen in 4 dogs (12.5%). Ascites represented by anechoic fluid was present in all (100%) (Fig. 3-4). These findings are in agreement with Webster (2010), who reported that hyper echoic liver was brighter than renal cortices and portal vein margins become indistinct. Increased echogenicity may accompany fibrotic liver disease, and hepatic neoplasia. Hyper echogenecity of the liver could be attributed to increased blood volume or due to uniform cellular infiltration leading to swelling of hepatocytes. Micro hepatica results from replacement of normal hepatocytes with fibrosis and results in reduced liver size (Jhonson, 2000). A diffusely hyper echoic liver parenchyma was associated with a poor

delineation of the walls of the portal vein and can give a false impression of a reduced number of hepatic vessels. Increased beam attenuation in the deeper portions of the hepatic parenchyma is consistent with fatty infiltration of the liver, steroid hepatopathy. But a small with irregular liver margins was indicative of chronic liver disease viz., cirrhosis and fibrosis (Seiler, 2013)

Fig. 3: Ultrasonogram in DPD with ascites- Appearance of hyperechoic liver than the adjacent renal cortex of right kidney with anechoic ascitic fluid

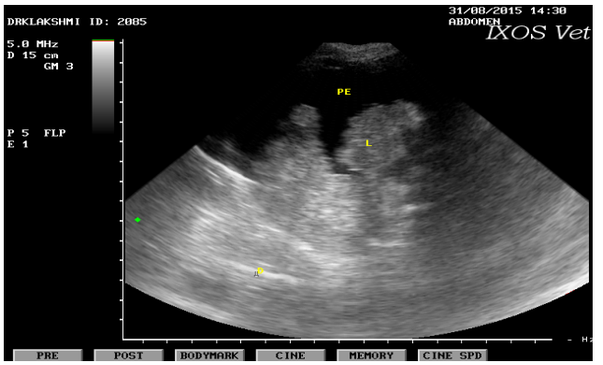

Fig. 4.: Ultrasonogram in DPD with ascites- hyper echogenecity of hepatic parenchyma with irregular liver margins and anechoic peritoneal effusion

Out of 32 dogs of diffuse parenchymal disorders without ascites, liver size was normal in 9 (28.12%) and enlarged in 23 (71.88%) dogs. The echogenic pattern revealed diffuse hyper, hypo and mixed echogenecity in 16 (50%), 13 (40.62%) and 3 (9.38%) dogs respectively. The liver margins were sharp in 4 (12.50%) and rounded in 28 (87.50%) dogs. Portal and hepatic veins were normal, dilated and in apparent in 16 (50%), 9 (28.12%) and 7 (21.88%) dogs respectively. The echo texture was coarse in 30 (93.75%) and heterogenous in 2 (6.25%) and hypo echoic masses were seen in 2 (6.25%) (Fig. 5-6).

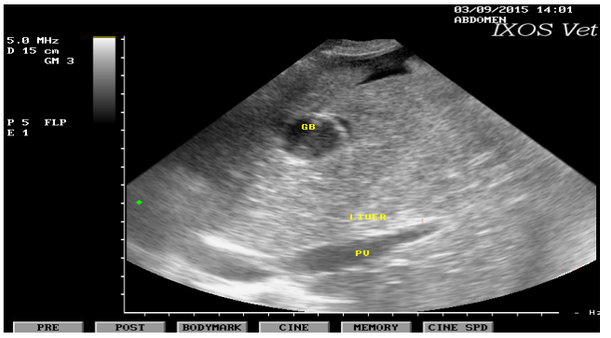

Fig. 5: Ultrasonogram in DPD without ascites- Dilated portal vein with echogenic walls and anechoic gall bladder suggestive of hepatic congestion

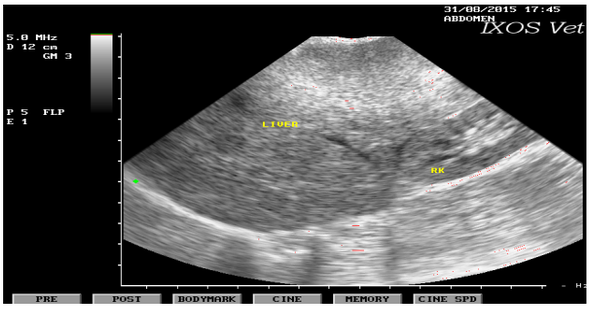

Fig. 6: Ultrasonogram in DPD without ascites- Mixed echogenecity with hepatic parenchyma extending beyond right kidney- suggestive of hepatomegaly

These findings were in agreement with Webster (2019), who opined that hypoechoic liver is less echogenic than renal cortices or isoechoic than spleen with enhanced visualization of portal vasculature and seen in suppurative hepatic disease, passive congestion, lymphoma and amyloidosis. As cardiopulmonary disorders were overruled by radiography, the evident hepatic congestion could be attributed to any obstruction to caudal venacava or an increase in central venous pressure. These findings are in agreement with the reports of Seiler (2013) and Biller (1992), who opined that decreased hepatic echogenecity reported in hepatic congestion was characterized by distended hepatic veins and. hepatomegaly was characterized by large volume between diaphragm and

stomach with rounded caudal ventral edges, which is highly appreciable in steroid hepatopathy, hepatic lipidosis, hepatic congestion, acute hepatitis, inflammation and neoplasia. Out of 24 dogs of focal parenchymal disorders, liver size was normal in 14 (58.33%) and enlarged in 10(41.67%). The echogenic pattern revealed iso echosgenecity, diffuse hypoechogenecity and mixed echogenecity in 4 (16.67%), 16 (66.66%) and 4 (16.67%), respectively. The liver margins were sharp, rounded and irregular in 12 (50%), 9 (37.5%) and 3 (12.5%) dogs, respectively. Portal and hepatic veins were normal, dilated and inapparent in 10 (41.67%), 9 (37.5%) and 5 (20.83%), respectively. The echo texture was coarse and heterogeneous in 15 (62.5%) and 9 (37.5%), respectively. Hypo echoic and hyper echoic masses were seen in 18 (75%) and 6 (25%) respectively (Fig. 7-8).

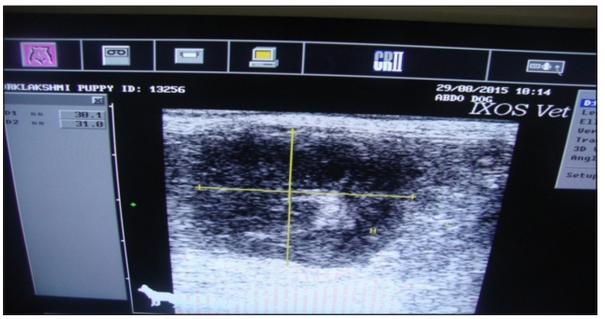

Fig. 7: Ultrasonogram in focal parenchymal disorders –Mixed echogenecity of focal mass in the hepatic parenchyma

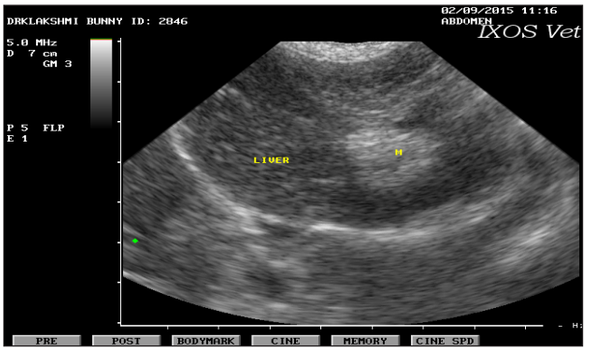

Fig. 8: Ultrasonogram in focal parenchymal disorders – Hyperechoic mass in the hepatic parenchyma

These findings were in agreement with Mircean *et al.* (2008) and Verma *et al.* (2011) reported focal inflammatory lesions (anechoic masses surrounded by an irregular hypoechoic rim), multicentric lymphoma (uni or multi focal hypoechoic masses), hepatic hemangiosarcoma (hypoechoic or anechoic structures). Differential diagnosis for a solitary hepatic mass includes hematoma, abscess, focal hyperplasia and primary neoplasia, all of which have a similar appearance and fine needle aspiration or biopsy was required for a definitive diagnosis (Seiler, 2013).

CONCLUSION

Based on ultrasonographic evaluation carried out on the suspected cases of hepatobiliary disorders, revealed changes in size (normal reduced and enlarged), echogenecity, (hyper, hypo and mixed echogenecity), margins (sharp, rounded and irregular), portal and hepatic veins (Normal and inapparent), hypoechoic masses and anechoic fluid.

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