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Doppler ultrasound evaluation of heptobiliary system in leopards (*Panthera pardus*)

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ABSTRACT

Ultrasonography has been considered as one of the most valuable diagnostic tools in veterinary medicine. The study standardizes the Doppler ultrasonographic hepato biliary biometric features in six leopards (*Panthera pardus*). The hepato biliary ultrasonographic examination was performed under general anaesthesia while lateral recumbency using a 3.5 MHz convex array transducer. The hepatobiliary images obtained at area covered the periphery just behind the sternum and last ribs of thorax on left and right side of abdomen. Gall bladder was visualized at a moderate pressure below the level of sternum. The hepato biliary measurements were recorded and it can be concluded that Doppler ultrasonography as valuable technique for measuring hepato biliary biometric features and could be used as reference values for diagnosis of hepato biliary diseases and disorders in leopards.

Key words: Gall bladder, Leopard, Liver, Ultrasonography.

INTRODUCTION

Ultrasonography in wildlife species serve as an important non-invasive tool for the accurate anatomical description (Alves *et al*., 2007). In wild canids, ultrasonographic studies are still restricted to the reproductive tract imaging (Souza *et al*., 2012). Previous reports of liver diseases in nondomestic felids include veno-occlusive disease in captive cheetahs and snow leopards (Munson and Worley, 1991) and telangiectasia, amyloidosis, lipomas, and biliary cysts in cheetahs and lions (Lucena *et al*., 2011). Doppler ultrasonography is used to examine blood flow characteristics. This technique is also used in conjunction with B-mode real-time ultrasonography to assess the pathology (Burk and Feeney, 2003). Thus, there is a need for systematic detailed study on diagnostic aspects related to diseases affecting the wild felids to commence the therapy at an earliest. Anatomical and physiological interpretation imaging studies may significantly lead to success of medicinal or surgical procedures (King, 2006). Biometric doppler ultrasonographic studies of the vital abdominal organs are still infancy in wild feline species. Thus, there is a need for systematic detailed study on diagnostic aspects related to diseases affecting the wild felids to commence the therapy at an earliest.

MATERIALS AND METHODS

The Doppler ultrasonography of hepato biliary system was conducted in six leopards in captivity at Vanvihar national park, by portable veterinary Doppler ultrasonography machine (Mindray M-5 Vet), using convex – linear probe (3-5 Mhz). All the six animals were examined for abdominal Doppler ultrasonography for hepato biliary evaluation in lateral recumbancy under general anaesthesia (Fig 1). Xylazine and ketamine at the rate of 1.5±0.25 and 3.5±0.5 mg/kg body weight respectively was administered intramuscularly using a blow pipe. The area covered the periphery just behind the sternum and last rib of thorax of both side of abdomen was prepared by clipping of long hairs. Following preparation of the site ultrasound gel was applied over the skin and convex probe was moved over the abdomen for Doppler screening. A moderate pressure was applied over the probe below the level of sternum to image the gall bladder.

RESULTS AND DISCUSSION

Liver was visualize immediately behind the diaphragm which appeared as a hypoechoic or normoechoic curved image with a hyperechoic border of diaphragm cranially in all the animals. The echotexture of liver was homogenous in appearance (Fig. 2, 3 and 4). Nyland and Mattoon (1995) stated separation of liver from the pleural cavity by diaphragm as an echogenic line, leading to a bright white curvilinear appearance as also noticed in the present study. The visualization of liver was found better during inspiratory phase of respiration which is in accordance to Green (1996). According to Cuccovillo and Lamb (2002) normal echogenicity of liver may vary in individuals. The texture of liver in all the animals was found to be normal i.e. coarse grained structure as also reported by Mwanza (1998) in domestic canine species. The hepatic veins appeared as anechoic tubular structure, whereas wall of portal veins were

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Fig 1: Doppler evaluation under general anaesthesia in leopard.

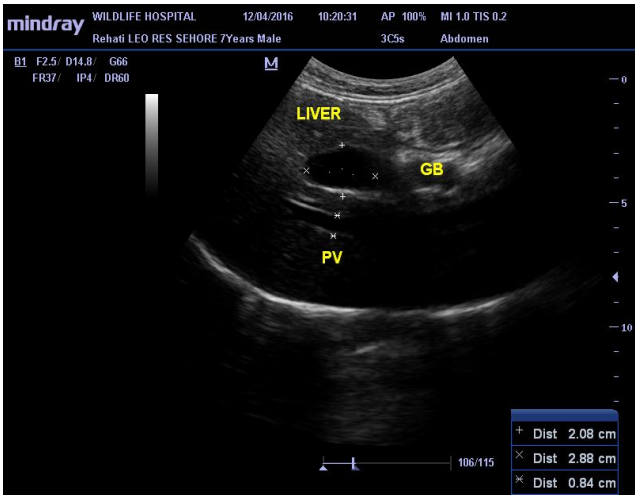


Fig 2: Dimensions of gall bladder and portal vein in ultrasound.

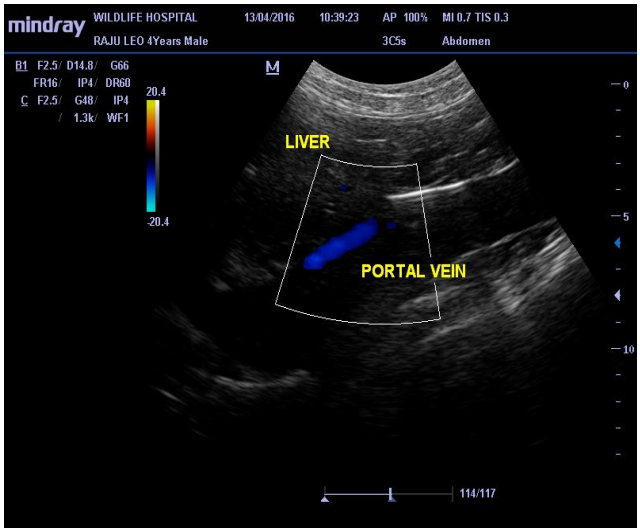


Fig 3: Portal vein in color Doppler imaging.

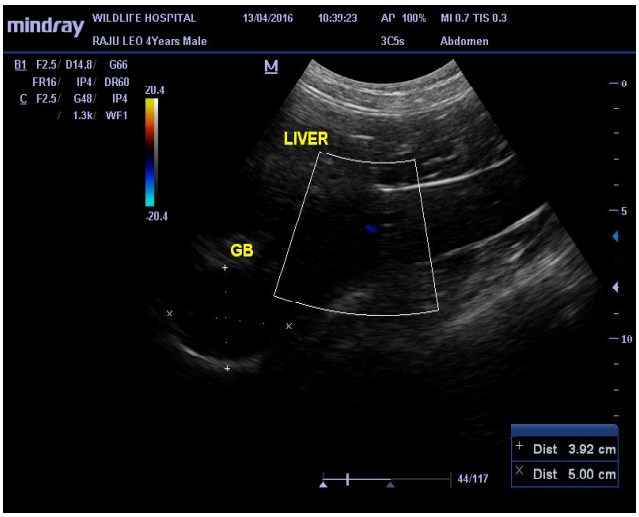


Fig 4: Doppler gall bladder diameter.

observed as hyperechoic image (Fig. 2) which could be attributed to presence of fibrous and fatty tissue surrounding the portal vein as has also been reported by Carlisle *et al.* (1991) and Nyland and Mattoon (1995). Szatmari *et al.*, (2004) and Sartor *et al.*, (2010) reported ultrasonography as an important diagnostic tool to diagnose pathologies of portal system in domestic canines.

The liver size was measured by taking a single longitudinal measurement at mid portion of liver. Barr (2008) estimated longitudinal and transverse measurement of canine liver and concluded that these measurements were useful in the estimation of liver size. The gall bladder appeared as an oval/pear shaped, anechoic structure towards the right side of midline all the three species (Fig. 2). The maximum length and width of the gall bladder measured in sagittal plane. The size of gall bladder was variable depending upon feeding status of animals. In case of anorexia and off feed a bigger size gall bladder has been observed might be due to bile stasis as also reported by Nyland and Mattoon (1995). Atalan *et al.* (2007) also measured length and width of the gall bladder and considered an important parameter for assessment of disorders. The wall of the gall bladder was observed as a fine clear echogenic line. Hittmair *et al.* (2001) also measured gall bladder wall thickness in domestic felids and suggested ultrasonography as an accurate method for measuring gall bladder wall thickness.

The liver size ranged from 9.56 to 11.29 cm with mean value of 10.54 cm in leopard. The gall bladder length and width ranged from 1.83 to 3.92 cm and 2.24 to 5.00 cm respectively and the wall thickness ranged from 0.42 to 0.68

Table 1 : Mean values of Doppler Ultrasonographic evaluation.

Parameter (cm)	Range	Mean
Liver size	9.56 - 11.29	10.54±0.24
Gall bladder length	1.83 - 3.92	2.38±0.32
Gall bladder width	2.24 - 5.00	3.16±0.42
Gall bladder wall thickness	0.42 - 0.68	0.56±0.04
Portal vein diameter	0.73 - 0.84	0.79±0.02

cm. Similarly the values of portal vein diameter ranged from 0.73 to 0.84 cm (Table 1). Barr (2008) and Bhadwal *et al.* (2000) estimated the measurements of canine liver and concluded that these measurements were useful in the estimation of liver size and found positive correlation between body weight and liver size.

The study concluded that Doppler ultrasonography is a valuable technique for measuring hepatobiliary biometric features and could be used as reference values for early diagnosis of hepatobiliary diseases and disorders in leopards.

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