ULTRASONOGRAPHIC ASSESSMENT OF IMPORTANT ABDOMINAL ORGANS IN A DOG NATURALLY INFECTED WITH *EHRLICHIA CANIS*

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ABSTRACT

Ultrasonography is an important non-invasive technique to find our abnormal findings (size, consistency and focal or generalized lesions) in visceral organs associated with various infectious and non-infectious diseases. Canine monocytic ehrlichiosis is one of the infectious, multisystemic disease of canines causing widespread pathological abnormalities in various body organs/tissue. Most common organs affected are liver, spleen and kidney which can be assess by the ultrasonographic technique in order to find out extent of damage and stage of disease progression. In present study, 30% of cases has been detected with hepatic enlargement with normoechoic and hypoechoic consistency in 53.33% and 46.67% of total cases, respectively. Splenic USG detected spleenomegaly in 33.33% cases with hypoechoic and heteroechoic consistency in 26.67% and 6.67% cases, respectively. Renal ultrasonography revealed loss of corticomedullary distinction in 10% cases with 23.33% cases showed hypoechoic consistency.

Key words: Ultrasonography, dog, *Ehrlichia canis*

Introduction

Multiorgan dysfunction with liver and spleen involvement is common in clinical cases of Canine Monocytic Ehrlichiosis (CME) (Ganguly and Mukhopadhayay, 2008). Ultrasonographic changes of liver and spleen in tick borne intracellular haemoparasitic diseases can be used as further diagnostic help apart from other diagnostic procedure. Ultrasonography is a useful imaging method in the evaluation of abnormalities, such as splenomegaly and changes in parenchyma, echogenicity and echotexture (Couto, 1992). Thus, ultrasound can be used as an important complementary tool in the diagnosis of canine ehrlichiosis, especially during the subclinical phase. Hepato-splenomegaly might have been due to multiplication of organism within circulating mononuclear cells and mononuclear phagocytic tissues of liver, spleen and lymph node (Parmar *et al*., 2013). Splenomegaly is because of reactive lymphoid hyperplasia and concurrent extramedullary haematopoiesis (Egenvall *et al*., 1997). The sonographic changes in gall bladder with distention might be due to anorexia.Keeping in view the importance of detection of ehrlichiosis induced ultrasonographic changes, the present study has been targeted to assess the USG changes in some of the important abdominal organs like liver spleen and kidney.

Materials and Methods

Ultrasound machine

In this study, the Esaote® MyLab30vetGold, Esaote Europe B.V., Philipsweg 1, 6227 AJ Maastricht, The Netherlands was used for per-cutaneous scanning of liver, spleen and kidney. The images were acquired with 5-7.5 MHz 2D curvilinear transducer.

Restraint and anaesthetic protocol

The animals were subjected to ultrasonographic examination without using any anaesthesia or sedatives with animals restrained in lateral recumbency.

Site preparation

The entire abdominal area was carefully shaved in order to scan complete liver, spleen and kidney. The animals were restrained in the lateral recumbency to scan the desired organs. Coupling gel was applied over the transducer as well as the area of interest in order to ensure an intimate contact between skin and transducer head. Animals were left undisturbed throughout the examination procedure in order to get optimum results.

Ultrasonography procedure

For ultrasonographic examination of liver, transducer was placed immediately behind the xiphisternum midline and angled craniodorsally to image a transverse section of liver. Then the transducer was moved gradually caudally remaining on the midline and transducer head was rotated through 90° to image a longitudinal section of liver on midline. Longitudinal views of the liver refer to the ultrasound beam being aligned along the long axis of the patient. The liver is scan fully in both transverse and longitudinal section by gently angling and moving the transducer from right to left. The gall bladder and the porta hepatis are useful landmarks for ultrasonography of the liver. Sonograms were evaluated for liver size, shape, contour and its internal architecture including alterations in echogenicity and intensity (anechoic/hypoechoic/hyperechoic/ normoechoic), and the presence or absence of free peritoneal fluid. For visualising the spleen, the patient is either placed on dorsal recumbency or right lateral recumbency (head of spleen). The spleen is systematically scanned in sagittal and transverse planes from ventral abdominal wall from head to tail. The spleen lies to the left and usually follows the greater curvature of the stomach. The position of spleen is variable,

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depending on the gastric contents. The head of the spleen is located under the border of the rib cage, while the body and tail of the spleen extend along the left abdominal wall or across the ventral abdomen. The spleen lies ventral (or) lateral to the left kidney. When it is enlarged it may cross the ventral midline and extends to the bladder region. The ultrasonographic picture of normal spleen is homogenous with fine echotexture. Spleen was visualised for its echotexture (homogeneous or heterogeneous) and echogenicity (hypo, hyperechoic or mixed), size (increased, decreased or normal) and borders (rounded or sharp). The spleen was considered normal if the contour was smooth and regular, and the parenchyma appeared uniform, finely textured, and more echogenic than the liver and the cortex of the left kidney (Nyland and Mattoon, 2002). For scanning the kidneys, the dogs were controlled in lateral recumbency, *i.e*., left lateral recumbency for right kidney and right lateral recumbency for left kidney. For most dogs a 5-7.5 MHz transducer is adequate while for large and giant breeds of dogs a 3.5 MHz transducer may be required. The left kidney is easier to image consistently as it lies just caudal to the last rib. The spleen may be used as an acoustic window. Longitudinal and transverse scans of the entire kidney should be performed. On the transverse plane the renal cortex and medulla, the area of the renal pelvis and renal vessels can be identified. The right kidney is often more difficult to scan in the dog as it lies partially under the rib cage and may be obscured by bowel gas. It is especially difficult to image in deep chested or large canine breeds, but is usually easily accessible in cats. The cranial pole of the right kidney is associated with the caudate liver lobe. Right lateral intercostal (between 11th and 12th intercostal spaces) approaches are often needed to more completely visualize the right kidney. Sonograms were evaluated for its size, shape, contour, echogenicity and distinction between its cortex and medulla.

Results and Discussion

Results of ultrasonographic findings are tabulated (Table 1) for easy understanding. B-mode ultrasound examination of liver showed hypoechoic echotexture, hepatomegaly and inflammatory changes. Gall bladder showed normal distention with clear bile/sludge. Out of 30 Ehrlichia positive cases, liver hypoechogenicity was noted in 14 cases and hepatomegaly in 9 cases. Splenic sonography revealed hypoechoic echotexture, inflammatory changes, sporadic hyperechoic foci, and splenomegaly. Out of 30 positive cases, splenic hypoechogenicity was seen in 8 cases while heteroechogenicity was noted in 2 cases and splenomegaly with rounded borders was observed in 7 cases. Kidney showed hypoechoic echotexture, inflammatory changes with normal physiological size. There was distention of renal pelvis in a few cases. Out of 30 positive cases hypoechoic kidney was seen in 7 cases and in 3 cases the renal architecture was poorly visualized with no distinction of cortex and medulla. Ultrasonographic scanning in the present study revealed hypoechogenicity of liver, hepatomegaly, splenomegaly, hepato-splenomegaly, hypoechogenicity of kidneys, loss of distinction between renal cortex and medulla. The present findings in cases of ehrlichiosis are in harmony with the findings of Kumar (2004). Hepato-splenomegaly might have been due to multiplication of organism within circulating mononuclear cells and mononuclear phagocytic tissues of liver, spleen and lymph node (Hildebrandt *et al*., 1963). Hypoechoic hepatomegaly may be due to reticuloendothelial hyperplasia or acute inflammation (Nelson and Couto, 2009). Hepatomegaly in case of tick born intracellular diseases could probably be due to passive congestion, reticuloendothelial hyperplasia or infiltrative diseases mediated through cytokines (Meyer and Twedt, 2000). Splenomegaly is because of reactive lymphoid hyperplasia and concurrent extramedullary haematopoiesis (Egenvall *et al.,* 2000). Causes of splenomegaly due to passive congestion are many *viz*., acute splenitis, haemolytic anaemia, toxaemia, extramedullary haematopoiesis and amyloidosis (Nyland and Matoon, 2002). The sonographic change in gall bladder included distention with presence of sludge/clear bile which may be due to anorexia (Kumar, 2004). Renal insufficiency as a complication of CME has been attributed to be immune-complex mediated leading to glomerulonephritis and proteinuria (Harrus *et al.,* 2002). The loss of architectural details is a significant feature of chronic renal disease and occurs due to gradual loss of nephrons over a period of time (Felkai *et al*., 1992; Sharma *et al*., 2016). Other sonographic changes included accumulation of traces of fluid in the peritoneal cavity which may be secondary to vasculitis or inflammation. So, the overall impression was indicative of inflammatory changes of kidney, liver and spleen.

Table 1: Showing USG changes in liver spleen and kidney

S. No.	Organ	Parameters		Percentage of occurrence
1	Liver	Echogenicity	Normoechoic	53.33%
			Hypoechoic	46.67%
		Hepatic Size	Normal in size	70%
			Hepatomegaly	30%
2	Spleen	Echogenicity	Normoechoic	66.66%
			Hypoechoic	26.67%
			Heteroechoic	6.67%
		Splenic Size	Normal in size	66.67%
			Spleenomegaly	33.33%
3	Kidney	Echogenicity	Normoechoic	76.67 %
			Hypoechoic	23.33 %
		Corticomedullary junction	Distinct	90%
			Lost	10%

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