

ULTRASONOGRAPHY OF LIVER AND SPLEEN IN BOVINE BENIGN THEILERIOSIS

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Ultrasonographic evaluation of liver and spleen was carried out in cattle suffering from bovine benign theileriosis. Diagnosis revealed bovine benign theileriosis (BBT) caused by *Theileria orientalis* and the conformation was done by Polymerase chain reaction. The ultrasonographic examination of the liver revealed increased echogenicity, which denotes diffuse hepatic changes, when correlated with the serum biochemistry showed a significant ($P<0.05$) reduction in mean serum albumin and an alteration in albumin-globulin ratio. The mean serum total protein and mean globulin was significantly ($P<0.01$) increased in theileriosis affected cattle compared to that of control group. The mean creatinine, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) had no significant difference in theileriosis cattle. The ultrasonography of splenic echogenicity was normal and within the parenchyma numerous tiny regularly spaced echoes and the blood vessels were imaged as anechoic round, oval or elongated images.

Key words: Diffuse hepatitis, *Theileria orientalis*, Ultrasonography

Since 1980s, ultrasonography has been used as an important imaging and diagnostic aid in veterinary medicine. It is an ideal and non-invasive method of imaging soft tissues, spleen, liver and other internal organs (Braun, 2003). Ultrasonography

with 3.5 MHz transducer provides sufficient depth and good quality resolution for visualization of organs and others structures (Braun, 2004). Ultrasonography in crossbred cows was performed using curvilinear transducer for assessment of

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spleen and liver (Imran *et al.*, 2011). Ultrasonographic images of liver, spleen and right kidney were recorded in Murrah buffaloes at different gestational stages (Constante and Acorda, 2012). The ultrasonography features of liver and spleen by Imran *et al.* (2011) examined the splenic vessels in both longitudinal plane and transverse plane which showed branching anechogenic bands and anechogenic oval to circular structures respectively, where as in case of hepatic parenchyma imaged as homogeneous echogenicity interspersed with hepatic vessels as arborizing anechogenic bands. The serum biochemistry of theileriosis cattle by Aulakh and Singla (2006), Hussein *et al.* (2007), Ugalmugla *et al.* (2010) revealed significant ($P \leq 0.05$) decrease in total proteins, albumin, globulin and significant ($P \leq 0.05$) increase in aspartate aminotransferase (AST) and alanine aminotransferase (ALT) in serum indicating liver involvement in theileriosis. The purpose of the study was to conduct an ultrasonographic evaluation of liver and spleen in cattle suffering from bovine benign theileriosis.

MATERIALS AND METHODS

One hundred and ten cross bred cattle suspected for theileriosis were considered for the study. Confirmation of theileriosis was done by PCR, using genus (*Theileria*) specific and species (*Theileria orientalis*)

specific primers as described by Oliveira *et al.* (1995) and Tanaka *et al.* (1993) respectively. Ultrasonography was carried out using real time 3.5 to 5 MHz liner or convex transducer probe.

Preparation of the site and positioning of transducer for examination of spleen in cattle:

For imaging of the spleen in cattle, left lateral aspect of the thorax was clipped and shaved starting from the caudal border of the forelimb and scapula to the caudal aspect of the last rib, and dorsally from the thoracic vertebrae transverse processes to the ventral midline. After that, the transmission gel was applied and scanning was carried out in each inter-costal space, from the dorsal to ventral with the transducer held parallel to the ribs. To determine the extent of the spleen, the left side ventral aspect of the thorax was scanned by holding the transducer parallel to the ribs as per Shyam manohar (2012). In accordance to Sebastien (2009) the spleen parenchyma was examined on the left side, from 7th to 12th inter-costal spaces of the animals.

Preparation of the site and positioning of transducer for examination of liver in cattle:

For visualization of liver, a rectangular area on the right side of the animal was shaved bordered cranially by the shoulder, dorsally by the spinous processes of the back, ventrally at the right

para-median area and caudally by the flank. The scanner was applied from caudal to cranial, beginning caudal to the last rib and ending at the fifth- inter costal space and dorsal to ventral in every inter-coastal, 10th to 12th inter-coastal for hepatic vessels and 11th to 12th for gall bladder (Shyam manohar, 2012).

For serum biochemistry analysis 5mL of the blood was collected and allowed to clot and the serum was separated by centrifugation (Hemi Pvt. Ltd.) (Col and Uslu, 2006). Serum was used for estimation of serum total protein (Tietz, 1986), albumin by modified Biuret and Doumas method (Varley *et al.*, 1980), creatinine, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) (Tietz, 1986) using semi auto-analyser (Secoman).

RESULTS

Ultrasonography of the spleen was examined from the distal portion of the 6th to 12th inter costal space. In hundred affected cases, the spleen was normal and within the parenchyma numerous tiny regularly spaced echoes and the blood vessels were imaged as anechoic round, oval or elongated images (Fig. 3 & 4).

For liver, the portal vein viewed from the tenth inter-costal space and caudal vena cava viewed from the eleventh inter-costal space revealed increased echogenicity of

the liver parenchyma which indicates diffuse hepatic changes (Fig. 1 & 2). Out of 100 theileriosis animals diagnosed by PCR, 65 animals showed diffuse hepatic changes. This indicates that a diffuse hepatitis was recorded in bovine benign theileriosis (BBT), which was correlated with the serum biochemistry value, a significant ($P < 0.05$) reduction in mean serum albumin and alteration in albumin: globulin ratio was observed in theileriosis cattle. A significant ($P < 0.01$) increase in mean serum total protein and mean globulin was observed in theileriosis cattle when compared to that of control mean and there is no difference noticed in mean creatinine, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) value in both affected and unaffected animals.

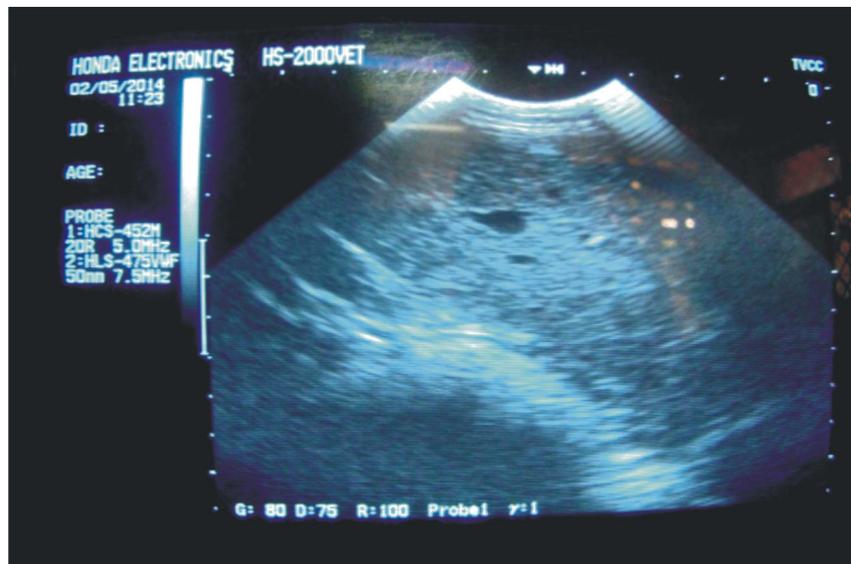
DISCUSSION

In the present study ultrasonography was used to record the splenic and hepatic changes in theileriosis in cattle, which is in concordance with Braun (2003) who described ultrasonography as an ideal, non-invasive method of imaging soft tissues, bovine liver and spleen, which is used as a diagnostic aid in veterinary medicine. Real time 3.5 to 5 MHz liner or convex transducer probe was used for visualization of liver and spleen in this study, which is in agreement with Braun (2004), who reported that ultrasound at 3.5 MHz transducer provided sufficient depth and

USG of liver and spleen in bovine benign theileriosis

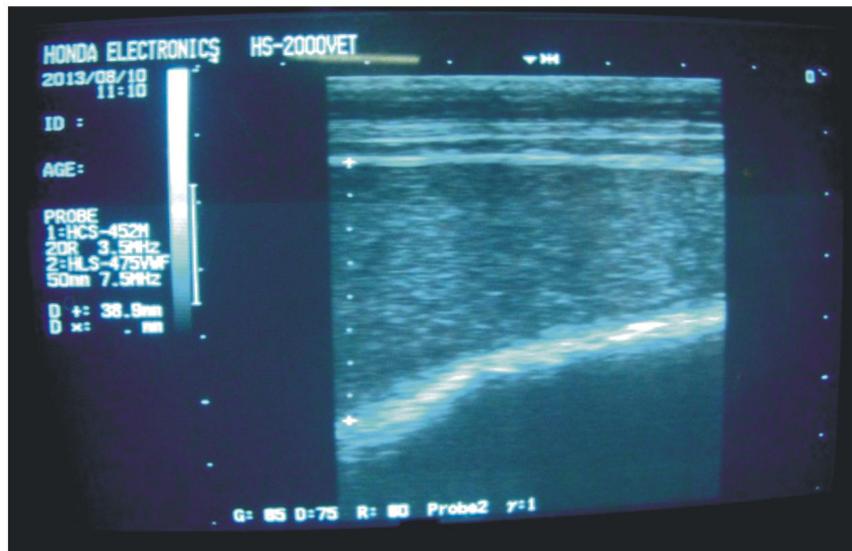
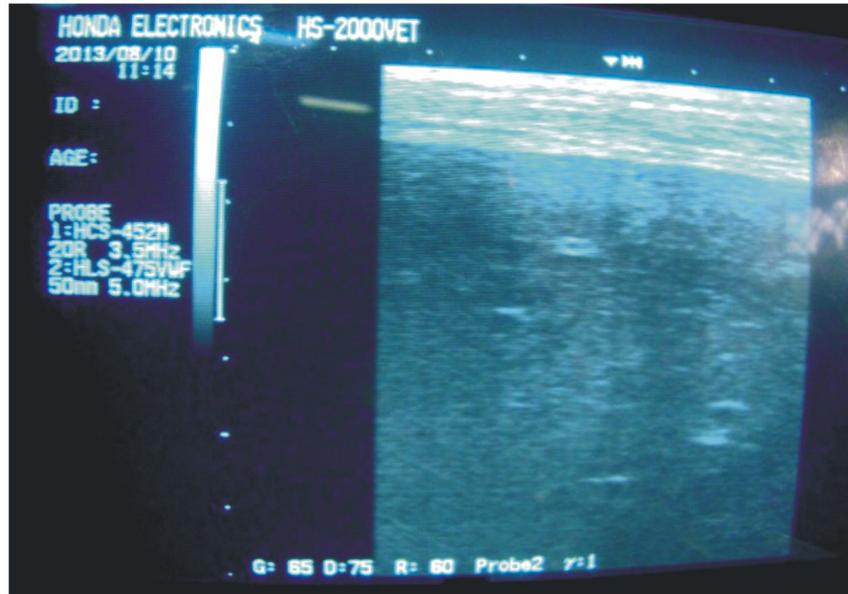


(Increased echogenicity of the liver denotes diffuse hepatic changes)
Fig. 1. Ultrasonogram of the liver and portal vein imaged from the tenth intercostals space in a cattle with *T. orientalis* infection



(Increased echogenicity of the liver observed, which denotes diffuse hepatic changes)
Fig. 2. Ultrasonogram of the liver and caudal vena cava imaged from the eleventh intercostal space in cattle infected with *T. orientalis*

USG of liver and spleen in bovine benign theileriosis



(The splenic parenchyma was normal with numerous small regularly space echo and vessels within the parenchyma and appearance as anechoic round to oval or elongated images)

Fig. 3&4. Ultrasonogram of the spleen imaged from the distal portion of the sixth intercostals space in a cattle with *T. orientalis* infection

good quality resolution for visualization of organs and other structures. In this study cross-bred animals with theileriosis were subjected to ultrasonography for examination of liver and spleen using liner or convex transducer probe which is in concordance with Imran *et al.* (2011) who did ultrasonography in crossbred cows using curvilinear transducer for assessment of spleen and liver.

The preparation of the site and positioning of transducer for examination of liver and spleen in cattle was done as per the method followed by Sebastien (2009). Nickel *et al.* (1987) explained the method of preparation and ultrasonography of spleen by real time scanner of 5.0-MHz linear probe.

In our study, liver was visualized on right side between 9th to 12th inter-costal space, hepatic vessels between 10th to 12th inter-costal space and gall bladder between 11th to 12th inter-costal space, which is in concordance with Shyam manohar (2012) and Acorda *et al.* (2009). Baun (2009) reported that ultrasonography image of portal vein showed a characteristic star shape structure of anechogenic image with a hyperechogenic wall, the caudal vena cava, was imaged at the ventral aspect of the last two inter costal space in all the cows but in eight cows at 10th inter-costal space and he concluded that this formed a systematic method for determination of size, positions and status of the liver and

spleen and their blood vessels in cattle which is in concordance with this study

. In this study, the ultrasound of spleen was normal and within the parenchyma numerous tiny regularly spaced echoes and the blood vessels were imaged as anechoic round, oval or elongated images which is in agreement with Imran *et al.* (2011).

Hussein *et al.* (2007) and Ugalmugla *et al.* (2010) revealed significant ($P \leq 0.05$) decrease in total proteins, albumin, globulin and significant ($P \leq 0.05$) increase in aspartate aminotransferase (AST) and alanine aminotransferase (ALT) in serum indicating liver involvement in theileriosis. This study revealed that the portal vein of liver viewed from the tenth inter-costal space and caudal vena cava viewed from the eleventh inter-costal space showed increased echogenicity of the liver parenchyma, which indicates diffuse hepatic changes due to theileriosis. The present study also correlated diffuse hepatic changes with the serum biochemistry values, which is in concordance with Aulakh and Singla (2006).

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