AN APPROACH TO ABDOMINAL ULTRASONOGRAPHY IN CAMELS (*CAMELUS DROMEDARIUS*) WITH SPECIAL EMPHASIS TO THE LIVER

By

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ABSTRACT

Abdominal ultrasonography is performed in 12clinically healthy dromedary camel calves using 3.5MHz curvilinear transducer. The ultrasonography is done on the right side of the animal while it is well restrained on the sitting position (sternal recumbency). The ages of the calves were between 18-36months and their weights are between 153-200kg.

B-mode real-time ultrasound machine (FUKUDA DENCHI -JAPAN) is used for the study. Position, length and width of the liver, position and depth of the Porta hepatis, length and caliber of the main portal vein as well as length and width of the kidney are determined.

In camel calves, the liver extended just from behind the 12^{th} rib caudally to the 7^{th} ICS cranially. The Porta hepatis could be clearly visualized at the 10^{th} ICS. The portal vein caliber (2.310 ± 0.192cm) was measured at the 10^{th} ICS and its length (11.11 ± 1.60cm) is measured at the 10^{th} -11^{th} ICS. The kidney is situated in the lumbo-costal angle just behind the liver.

The present ultrasonographic values obtained in healthy camel calves could be used as reference diagnostic indices for pathological changes in the liver and kidney as ultrasonography is proofed to be reliable, rapid and non-invasive method for imaging internal organs, particularly for detecting hepatic and renal pathology in other animal species.

INTRODUCTION

Ultrasound is a quick safe and painless procedure which allows the examination and evaluation of position, shape, size, tissue density and internal architecture of abdominal and thoracic organs.

Liver diseases, generally, result in variations in metabolism and overall health status of the animal. Past studies on the liver in dairy cattle were based mostly on clinical determination of various components of blood and serum. Since variations in these constituents reflect not only changes in the liver but in other organs and tissues as well, it is difficult to assess the status of the liver without resorting to liver biopsy (Acorda *et al.*, 1994).

Ultrasound has been used routinely for several years as a diagnostic tool in dogs and horses with liver diseases (Braun, 1990). In the horse ultrasonography is used to investigate hepatic, renal, splenic, and umbilical and certain gastrointestinal diseases. It is the technique of choice for characterizing abdominal masses and can be used effectively to facilitate biopsy of organs. In the absence of ultrasonographic imaging the horse's abdomen is relatively inaccessible to the clinician (Marr, 1996). In small animals, ultrasonography has made a major impact on the diagnosis of abdominal diseases and is now established as a rapid non- invasive technique for obtaining information about increasing number of abdominal disorders (Lamb, 1996). Ultrasound is not yet adopted as a diagnostic tool in veterinary clinics in the Sudan. However, only one study has been done on pregnancy diagnosis in goats (Abdelghafar, 2006). To our knowledge, detailed information about the normal length, width of the liver, portal vein caliber and length, depth of the Porta hepatis as well as renal length and depth have not been reported in camels using ultrasonography.

The aim of the present study was to detect the best sites for examining the liver and kidney and studying their internal architecture as well as the site of the pancreas and duodenum in dromedary camel calves.

MATERIALS AND METHODS

Animals: The ultrasonographic examination was carried out on 12clinically healthy camel calves, 18-36months of age and weighing between 153-200kg. They were housed and managed at the College of Veterinary Medicine and Animal Production, Sudan University of Science and Technology, Hilat Kuku, Khartoum State, Sudan. They were fed *Sorghum halepense* (*Abu 70)*, adlib with free access to water.

Methods: Animals were fasted for 14hours prior to the scanning. The area of scanning was clipped and shaved carefully. The ultrasonographic examination

and measurements were done using B-Mode Real-time ultrasound machine (FUKUDA DENSHI, Japan) with 3.5 MHz extra abdominal curvilinear transducer (Fig. 1). The measurements were done on the right side of the animal while it was well-restrained on the sitting position (Fig. 2). Liberal amount of ultrasonic gel (Sonogel® -Germany) was applied to the area of scanning which extended from just behind the 12th rib caudally to the 7th intercostal space (ICS) cranially.

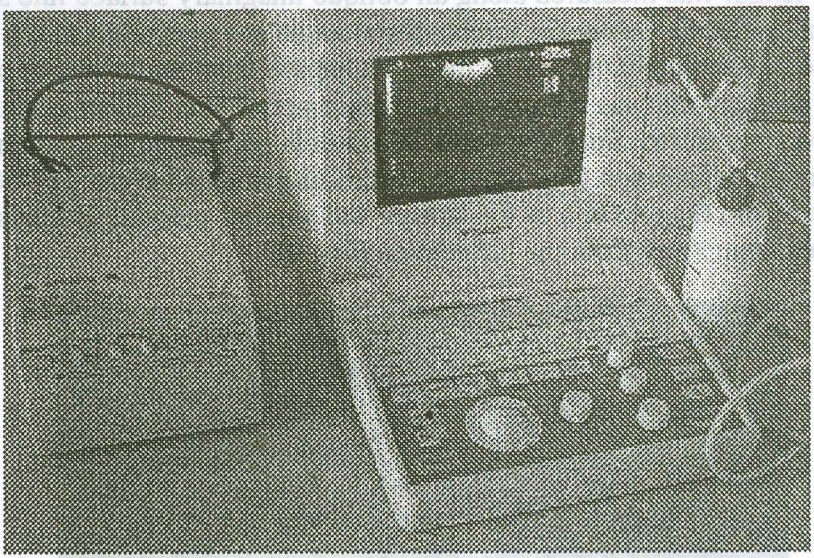

Fig. (1): Ultrasound machine

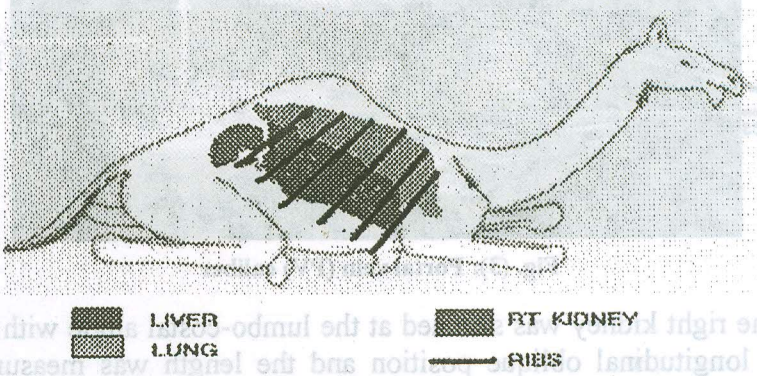

Fig. (2): Animal positioning during examination

Initially the position and texture of the liver, Porta hepatis and portal vein were established and all measurements were done with the probe held in a parasagittal plain perpendicular to the ribs. The vertebral extremity was taken as a reference point for all measurements. Distances between the reference point and the dorsal and ventral margins of the liver were measured at each ICS. The difference between the two distances constituted the liver width at each ICS. The liver length was measured along an oblique imaginary surface line starting just caudal to the 12th rib at the lumbo-costal angle and extending to the 7th ICS just above the sternum. Distance of the Porta hepatis from the reference point in the liver parenchyma was measured. The main portal vein caliber at the Porta hepatis was measured from outwards to inwards at its widest portion 4mm away from the bifurcation (Fig. 3), PV length was measured at the 11th-10th ICS, 2mm away from the junction of the splenic and anterior mesenteric veins to the widest area 4mm away from the bifurcation (Fig. 4).

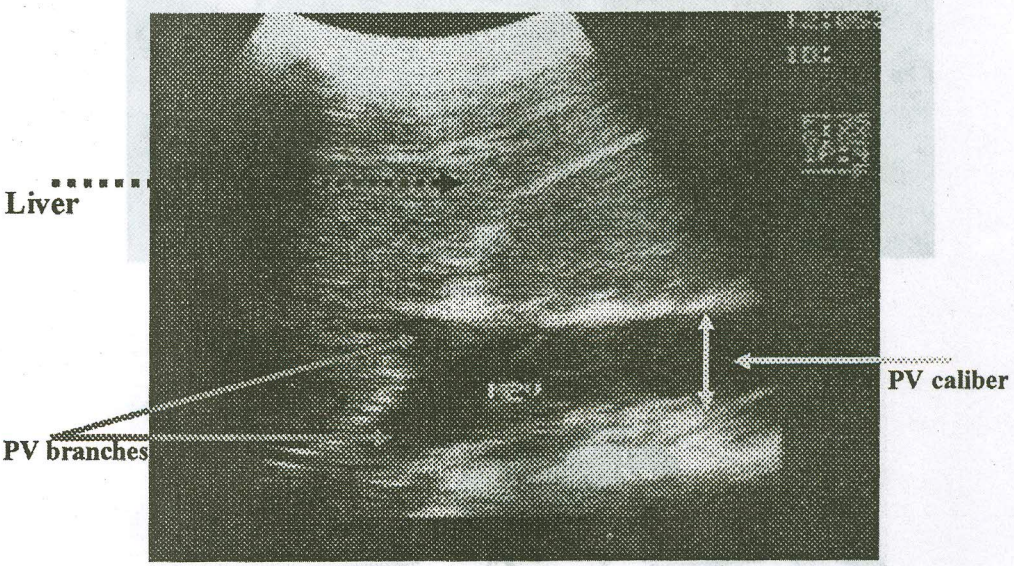

Fig. (3): Portal vein (PV) caliber

Kidney: The right kidney was scanned at the lumbo-costal angle with the probe held in a longitudinal oblique position and the length was measured at the

longest axis. The width was measured perpendicular to the previous measurement (Fig. 5).

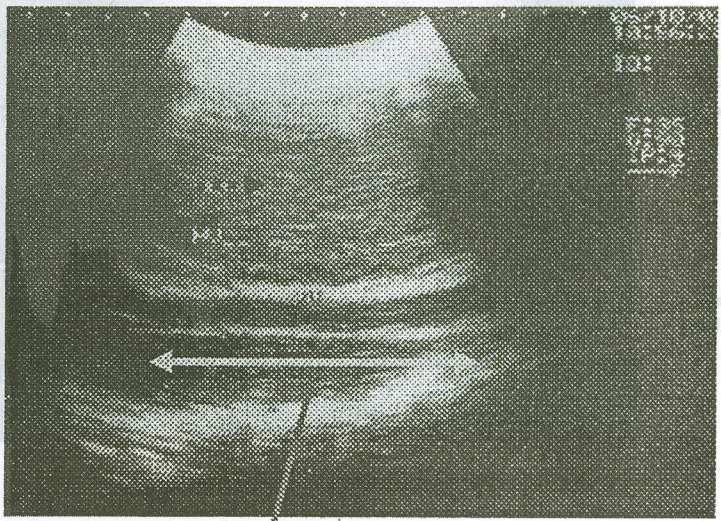

Fig. (4): Portal vein (PV) length

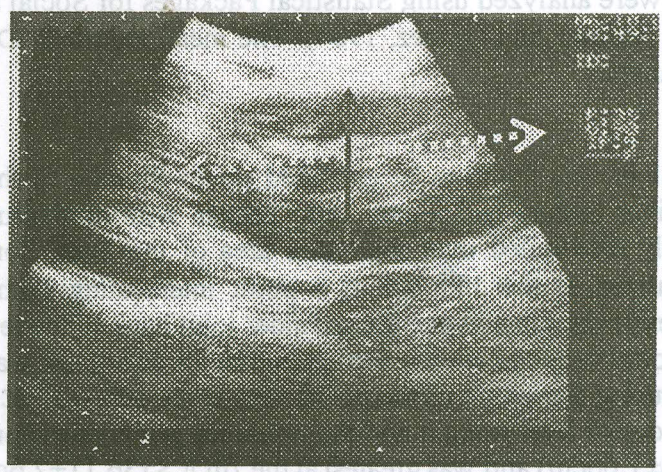

Fig. (5): Renal length and width

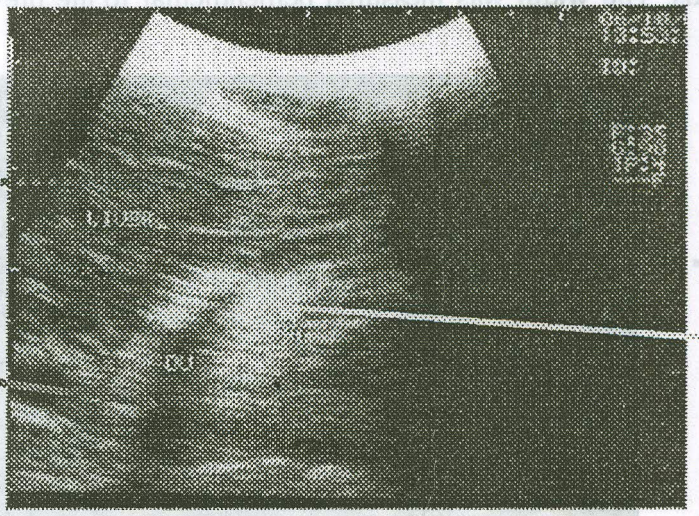

Fig. (6): Pancreases and duodenum

STATISTICAL ANALYSIS

Data were analyzed using Statistical Packages for Social Sciences (SPSS) version 11.5 (Gomez and Gomez, 1984). The mean values ± SD were obtained for each parameter

RESULTS

The liver was found to be extended caudo-dorsally to the lumbo-costal angle. The liver texture had a gray echo pattern with numerous weak echoes homogenously distributed over the entire area of the liver. Porta hepatis was clearly visualized at the 10^{th} ICS at a point intersecting with an imaginary surface line extending just above the shoulder joint back to the level of the tuber coxae. The portal vein was readily recognized by its echogenic walls and the best site for measuring the length of the portal vein is the 10^{th} -11^{th} ICS. The distance between the dorsal liver margin and the reference point was shortest behind the 12^{th} rib (8.22±1.66cm) and was greatest at the 7th ICS (36.11±2.6cm).

The pancreas and duodenum (Fig. 6) were identified in the area of the Porta hepatis (10^{th} ICS); the echo texture of the pancreas is hyperechoic than the liver.

No liver abnormalities such as cysts, abscesses or calcifications were seen. Liver length and width at each ICS, distance of the Porta hepatis, portal vein length and caliber as well as renal length and depth are shown in (Table 1).

Table (1): Mean ± SD of ultrasound measurements of the liver, kidney, portal vein and Porta hepatis in camels (n=12)

Parameter	Mean (cm)	SD (cm)
Liver length	34.750	5.391
Liver width	25.75	2.06
Portal vein caliber	2.310	0.192
Portal vein length	11.11	1.60
Porta hepatis distance from the reference point	23.22	1.394
Distance of the dorsal margin of the liver behind 12th rib	8.22	1.66
Distance of the dorsal margin of the liver at 11th ICS	13.66	1.581
Distance of the dorsal margin of the liver at 10th ICS	19.50	1.457
Distance of the dorsal margin of the liver at 9th ICS	25.22	2.27
Distance of the dorsal margin of the liver at 8th ICS	30.55	2.127
Distance of the dorsal margin of the liver at 7th ICS	36.11	2.619
Renal length	12.67	0.171
Renal width	6.093	0.491

DISCUSSION

The present study provides ultrasonographic data for the first time on the liver and kidney of healthy dromedaries' camel calves. Although there are many studies have been reported in ***Camelus dromedarius*** using ultrasonography concerning pregnancy diagnosis (Skidmore *et al.*, 1992) ocular studies (Tibary and Anouassi, 2001; Osuobeni and Hamidzada, 1999; Hamidzada and Osuobeni, 1999) and in evaluation of the ovaries status (Vyas *et al.*, 2004; Vyas *et al.*, 2006; Tinson and McKinnon, 1992). However, to our knowledge, no similar data concerning liver and kidney are available in the literature for comparison. Since diagnostic ultrasonography enables the clinician to get an accurate assessment of the liver, the present findings revealed that the liver of camel calves could be scanned at the right side from the lumbo-costal angle caudally to the 7thICS cranially.

The present measurements of the portal vein were consistent. Calibers exceeding 2.310±0.192cm may indicate congestion of the PV in camel calves. The echogenic walls of the portal vein are probably due to the connective tissue in the portal tracts. The rib cage of the camel occupies most of the abdomen and

as the liver is almost entirely situated inside the rib cage, access to the liver in the camel is so difficult at clinical examination. Hence, ultrasonography is the method of choice for evaluating liver problems.

Renal length and width could be accurately measured by ultrasonography. Renal length measurements above (12.67±0.17) cm or renal width more than (6.09±0.49) cm may indicate pathological abnormalities in camel calves. Any backward displacement of the kidney may indicate hepatomegally as the right kidney directly borders the liver in the caudal side.

CONCLUSIONS AND RECOMMENDATIONS

Ultrasound is a rapid, non-invasive and reliable method for investigating the liver and kidney of the camel. Liver biopsy could also be done under guidance of ultrasound. With the animal in the sitting position, tranquilizers are advised for the safety of the operator and the machine. Scanning with the standing position in a crush may be tried. As the area of scanning is very large, clipping and shaving is a tedious and time-consuming process. Therefore, it is highly recommended to develop hair removers for animal use.

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