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ULTRASONOGRAPHIC FINDINGS IN CAMELS (*Camelus dromedarius*) WITH TRYPANOSOMIASIS

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ABSTRACT

The purpose of this study was to characterise the ultrasonographic findings in camels (*Camelus dromedarius*) with trypanosomiasis. Forty-two camels with chronic weight loss, subcutaneous oedema and ascites were examined. The passive haemagglutination test showed that 38 (90%) were positive for *Trypanosoma evansi*. Ultrasonographic examination was carried out twice, before and three weeks after treatment. On admission, ultrasonographic findings included presence of abdominal fluids within the abdominal cavity where livers and intestines were imaged floating in a hypoechoic fluid. Transrectal examination showed excessive amounts of hypoechoic fluid where urinary bladder and other pelvic organs were floating in a hypoechoic fluid. The caudal vena cava did not appear triangular but oval to round in shape. The hepatic and portal veins appeared distended and bile duct calcification and hepatic abscessation was detected. Ultrasonographic examination of the thorax revealed hydrothorax and hydropericardium. Except 2 cases of bile duct calcification and 1 of hepatic abscessation, no detectable gross sonographic lesions were detected while imaging the hepatic and renal parenchyma and the heart and its valves and major blood vessels. Three weeks after treatment, no fluids were imaged in the peritoneum, the pericardium and pleura and the caudal vena cava, hepatic and portal veins appeared normal. Twenty-three camels (66%) were fully recovered, however, the condition of 12 (34%) deteriorated and therefore necropsied and thoroughly examined. In camels with trypanosomiasis, ultrasonographic findings support the clinical and laboratory data, effective in excluding other causes of abdominal distension and can be used to assess the progress in treated animals.

Key words: Camel, dromedary, imaging, trypanosomiasis, ultrasonography

Trypanosomiasis is considered the most serious pathogenic protozoal disease of camel in the Middle East, Africa and Asia (Higgins *et al,* 1992; Wernery and Kaaden, 2002). This disease is a major enzootic disease, causing a great impairment of productivity and is considered the most economically important disease of camel herds (Boid *et al,* 1985; Lohr *et al,* 1986; Enwezor and Sackey, 2005). *Trypanosoma evansi* (*T. evansi*) is the major trypanosome affecting camels, causing a disease called Surra (Fowler, 2010). In the Middle East and Africa, camels are most often affected. Other animals including horses, mules, cattle, buffalo and deer can also be affected by Surra (Brun *et al,* 1998; Luckins, 1998).

In camel, the disease is usually chronic but can be acute with 90% mortality, if not treated (Luckins, 1992). Clinical signs and pathological lesions caused by *T. evansi* in camels are unreliable for a definitive diagnosis (Olaho-Mukani and Mahamat, 2000). In addition, finding the organism in the peripheral blood of infected camels may be highly problematic because of the low numbers of the organisms and fluctuating parasitaemia. The development of a suitable serological ELISA test has been found to be effective in decreasing the economic losses associated with Surra. Other DNA technologies are being used in endemic countries (Fowler, 2010).

To the best of the authors' knowledge, no sonographic studies were carried out in camels with trypanosomiasis. Adjunct to conventional diagnostic methods, the present study was designed to determine the effectiveness of ultrasonography in camels with trypanosomiasis and to evaluate the progress of treatment in such cases.

Materials and Methods

Animals, history and physical examination

Forty-two (*Camelus dromedarius*) (aged 7-12 years) were examined in the present study. Camels were referred because of inappetance, loss of body condition, ventral or presternal oedema and abdominal distension. Duration of illness ranged from 3 days to 5 weeks. The passive haemagglutination test showed that 38 camels (90%) were positive for *T. evansi*. Animals were examined at Veterinary Teaching Hospital, Qassim University, Saudi Arabia

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between 2009 and 2012. Clinical examination of camels was carried out as described by Köhler-Rollefson *et al* (2001). After first examination, camels were injected subcutaneously (SC) with two doses of a trypanosomicide, Alquin®-1.5 (Quinapyramine sulphate, Vetnex, Riyadh, Saudi Arabia) (17 ml SC) two weeks apart and intramuscularly (IM) with 5 successive doses of an antioedematous – anti-inflammatory agent, Diurizone®, (Hydrochlorothiazide + Dexamethasone, Vetoquinol, LURE Cedex, France) (12 ml IM). Animals were also injected IM with 5 successive doses of iron and cobalt containing agent. Fifteen clinically healthy camels were enrolled in this study as controls.

Ultrasonographic examination

In the recumbent position, ultrasonographic examination of control and sick camels was carried out percutaneously and transrectally using 3.5 and 5.0 MHz transducers (SSD-500, Aloka, Tokyo, Japan). The procedure was carried out twice, before and three weeks after treatment. Animals were primarily sedated using xylazine 2% (0.1mg/kg BW IV, Alcomed, Holland). On both sides of the abdomen and thorax, the hairs were clipped and then the skin was completely shaved. Camel were examined starting from the caudal abdomen and extending forward to the third intercostal space on both sides of the thorax. In the abdomen, the peritoneum, stomachs, spleen, small and large intestines, liver, pancreas and kidneys were imaged. In the thoracic cavity, the lungs, heart and its major blood vessels and the mediastinal region were scanned.

Results and Discussion

Of the thirty eight camels with distended abdomens, 35 were positive for trypanosomiasis, two had liver hydatid cyst and one had cardiomyopathy. In addition to having ascites, six animals with hydatidosis also showed varying signs of congestive cardiac failure, including generalised oedema (especially submandibular and presternal oedema, but rarely limb oedema), dilated jugular veins and hepatomegaly.

The most prominent clinical presentations in the camels were weight loss in 13 (37%) and abdominal distension in 22 camels (62%). On clinical examination, ascites was detected by a fluid thrill on ballottement and was evidenced by abdominocentesis. Ventral and subcutaneous presternal oedema was apparent in 25 (71%) camels. Other clinical findings included weak and irregular ruminal contractions in 31 (89%), inappetance in 33 (94%), elevated body temperature in 1 (3%), recumbency in 5 (14%), diarrhoea in 9 (26%) and decreased milk production in 9 camels. Twenty days after treatment, abdominal distension and ventral and presternal oedema disappeared in 23 (66%) cases (Fig 1). Examination of blood smears of the affected camels showed that the parasites were detected in only one camel (3%).

On admission, ultrasonographic findings included presence of abdominal fluids where hypoechoic livers and intestines were imaged floating in anechoic fluid (Figs 2 and 3). Transrectal examination also revealed presence of excessive amount of anechoic fluid where urinary bladder and other pelvic organs were also floating in anechoic fluid (Fig 4).

Compared to control camels, the caudal vena cava did not appear triangular but oval to round in shape in 7 camels (20%). Other ultrasonographic findings included distended hepatic and portal veins in 6 camels (17%), bile duct calcification in 2 cases (6%) and small hepatic abscess in 1 camel (3%). Ultrasonographic examination of the thorax revealed hydrothorax and hydropericardium in 7 camels (20%). Compared to imaging patterns in control camels, the liver and spleen appeared large in 7 cases (20%). Except of the 2 cases of bile duct calcification and 1 case of hepatic abscessation, no detectable gross sonographic lesions were detected while imaging the hepatic and renal parenchyma and the heart and its valves and major blood vessels.

Three weeks after treatment, in 23 camels (66%), no fluids were imaged in the peritoneum, the pericardium and pleura and the caudal vena cava, hepatic and portal veins appeared normal. No detectable abnormalities were observed while imaging kidneys, pancreas, aorta and pulmonary artery.

In this study 23 animals (66%) were recovered after treatment. Twelve camels (34%) did not respond to treatment and their conditions deteriorated and therefore necropsied and thoroughly examined postmortem. Necropsy findings included emaciation in 13 camels (37%), subcutaneous oedema in 25 (71%), ascites in 22 (62%) and hepatomegaly, spleenomegaly, hydrothorax and hydropericardium in 7 cases (20%).

In camel practice, the application of ultrasonography is still very limited. It is mostly used for reproductive examination and for pregnancy diagnosis in female camels (Wani and Skidmore, 2010; Ali *et al,* 2010). In the field of internal medicine,

Fig 1. Severe abdominal distension (A) in a camel with trypanosomiasis. Abdominal distension and ventral and subcutaneous oedema disappeared (B) twenty days after treatment.

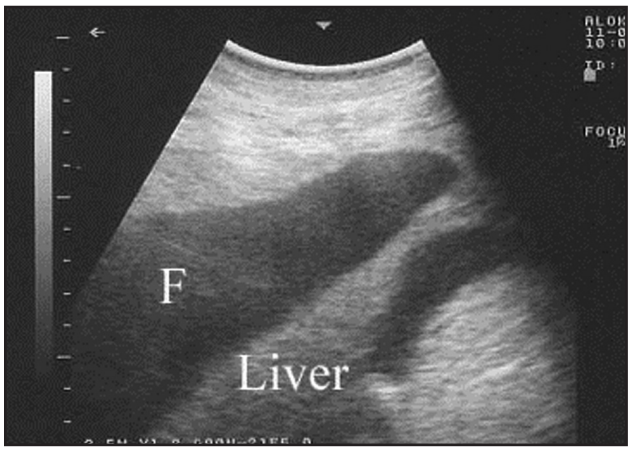

Fig 2. Abdominal ultrasonograms in a camel with trypanosomiasis. showing hyperechogenic liver amid a hypoechoic fluid (F).

however, no ultrasonographic studies were found in camels. In this study, we report the ultrasonographic findings in camels affected with trypanosomiasis.

Trypanosomiasis was suspected in camels that showed a chronic weight loss, subcutaneous oedema and ascites. The clinical findings were in agreement with those of other reports (Köhler-Rollefson *et al,* 2001; Wernery and Kaaden, 2002; Fowler, 2010). Definitive diagnosis was made on the basis of detecting trypanosoma species in blood smear or its antibodies in serum by passive haemagglutination test. Leukocytosis and hyperglobulinaemia encountered in this study could be explained on the basis of the chronic nature of the disease. This denotes that camels with trypanosomiasis may develop concurrent and even fatal bacterial, viral and other protozoan infections as a result of immunosuppression (Aradaib and Majid, 2006; Tran *et al,* 2009). Haematological indices showed significant reduction in the haematocrit and haemoglobin indicated that affected camels had macrocytic hypochromic anaemia in an agreement to a study reported recently (Saleh *et al,* 2009).

Clinical findings including chronic weight loss, subcutaneous oedema and ascites may be associated with trypanosomiasis but not necessarily indicative of the disease in camels (Fowler, 2010). In such circumstances, differential diagnosis include malnutrition, chronic parasitism, Johne's disease, heart diseases specially endocarditis, hepatic insufficiency and renal impairment. In this study, ultrasonography was valuable in camels with trypanosomiasis in detecting abdominal and thoracic findings that confirmed postmortem. Using ultrasound, it was

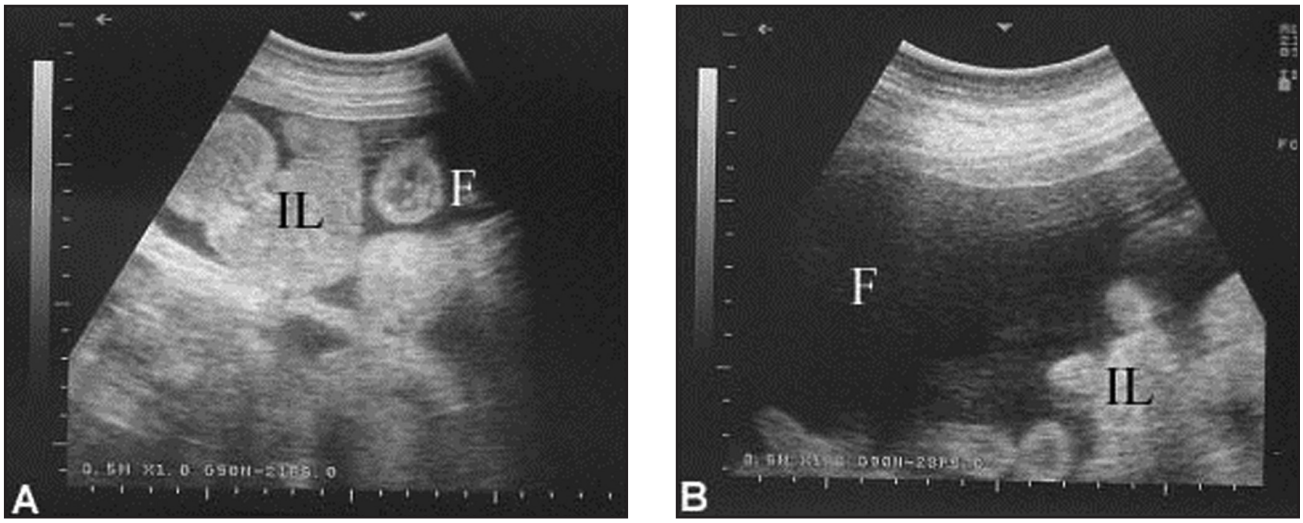

Fig 3. Cross-sectional ultrasonograms of intestines in 2 camels with trypanosomiasis. The intestinal loops (IL) appeared hyperechogenic and were surrounded by anechoic fluid (F).

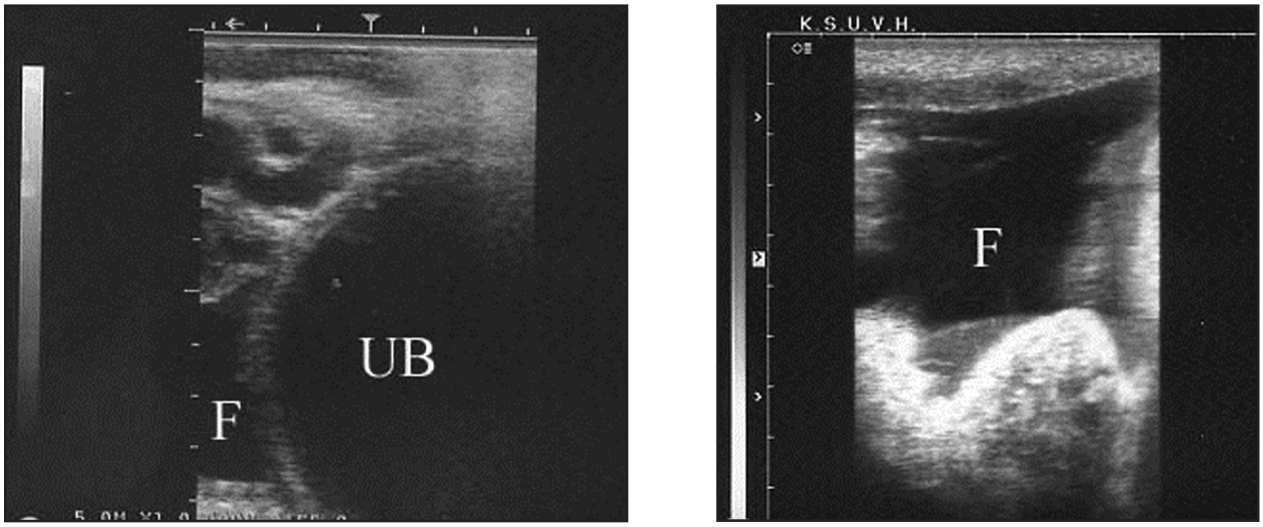

Fig 4. Transrectal ultrasonograms in 2 camels with trypanosomiasis. The intestinal loops and wall of urinary bladder (UB) appeared hyperechogenic and are floating in a anechoic fluid (F).

possible to rule out lesions in other lesions in liver, kidney, heart and intestines with a high degree of certainty. In addition, diagnostic ultrasound enabled serial examinations to monitor the progression of the condition and response to treatment where no fluids were imaged in the peritoneum, the pericardium and pleura and the caudal vena cava, hepatic and portal veins appeared normal.

In camels, there are many disease conditions in which ascites has been reported. These conditions include severe liver damage, such as cirrhosis caused by the ingestion of Senecio species (Pearson, 1977; de Barros *et al,* 1992). Other causes of liver damage, such as acute copper poisoning (Mylrea and Byrne, 1974), subacute fasciolosis (Tharwat, 2012) or hepatic abscessation (Braun *et al,* 1995), can also lead to the development of ascites. Thrombosis of the caudal vena cava (Stober, 1966) may also induce ascites as a result of the blockage of the hepatic veins.

In this study, ultrasonography in camels with trypanosomiasis was highly effective in supporting the clinical and laboratory data and in excluding other conditions that lead to abdominal distension as hepatic, renal or cardiac lesions, and we believe that the approach would expedite the diagnosis. In camels with trypanosomiasis, ultrasonographic findings were also helpful and prognostic in assessing the progress in treated animals.

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