



## Ultrasound-guided hepatic and renal biopsy in camels (*Camelus dromedarius*): Technique development and assessment of the safety

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### ABSTRACT

The purpose of this study was to develop a safe ultrasound-guided technique for biopsy of the liver and kidneys in camels (*Camelus dromedarius*). Eighteen camels divided into 3 groups were used; 6 each for biopsy of the liver and right and left kidneys. Of each group, 2 were biopsied and immediately slaughtered. The remaining 4 in each group were biopsied and then kept for 9-day observation period. When the liver was biopsied, single pass was adequate for obtaining an adequate hepatic sample in all camels. When the right kidney was biopsied, sufficient sample was obtained from the first endeavor in 5 of the 6 camels. Two attempts were necessary in the other camel. When the left kidney was biopsied, sufficient sample was obtained from the first attempt in 4 of the 6 camels. Two attempts were necessary in one camel and 3 attempts were necessary in the remaining camel. No evidence of immediate or delayed haematuria was observed post-biopsy. In camels with liver biopsy, only aspartate aminotransferase was elevated ( $P < 0.05$ ) for 2 days post-biopsy. When the kidneys were biopsied, a neutrophilic leukocytosis ( $P < 0.05$ ) was detected for the 24–48 h post-biopsy. In the 6 camels immediately slaughtered after hepatic and renal biopsy, there was a small subcutaneous haematoma. One camel with biopsy of the left kidney had a 0.8 cm subcapsular haematoma. In the 12 camels kept for 9-day observation period, there were insignificant subcutaneous traces of blood with no gross changes indicative of peritonitis in any of the camels. Only one camel with biopsy of the left kidney had a small perirenal haematoma. Ultrasound-guided hepatic and renal biopsy in camels is safe, fast, cost-effective, and practical as long as it is performed properly.

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### 1. Introduction

In human medicine, ultrasound-guided, percutaneous hepatic and renal biopsies are frequently performed in order to obtain samples for pathologic and cytologic examination (Hergesell et al., 1998; Saloura et al., 2010; Yesudas et al., 2010). Through the histological analysis of the hepatic and renal tissue an etiological diagnosis can be performed, a

prognosis can be issued and the therapy of the majority of parenchymal hepato-nephropathies can be oriented. The technique is also a well-documented procedure in cattle (Mohamed and Oikawa, 2008), horses (Modransky, 1986) and dogs and cats (Leveille et al., 1993; Osborne et al., 1996). It has been demonstrated that diagnosis and therapy are modified in about 40% of cases following renal biopsy (Richard et al., 1994) and that the technique used alters the clinical prognosis in about 50% of cases (Turner et al., 1986).

Percutaneous ultrasound-guided tissue core biopsy and fine-needle aspiration are minimally invasive and cost-effective methods of obtaining specimens for histologic evaluation and bacteriologic culture in cattle (Mohamed and Oikawa, 2008) and dogs and cats (Leveille et al.,

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1993). In cattle, the risk of serious renal biopsy-induced complications is extremely low when ultrasound visualization is used (Mohamed and Oikawa, 2008). It has been concluded that utilizing the ultrasound-guided biopsy technique, biopsy of the renal parenchyma is safe, practical and reliable and requires only one operator.

In camels, hepatic and renal diseases are relatively common (Al-Ani, 2004; Bakhsh, 2004). Most of these diseases are usually misdiagnosed as a cause of illness because signs may be subtle. In addition, diagnostic laboratory methods are insufficient as hepatic enzymes can also be elevated in camels with cardiac or skeletal muscle damage (Bakhsh, 2004; Fowler, 2010). Ultrasonography is a valuable and applicable diagnostic method that can be used to evaluate hepatic and renal structures (Braun, 2009; Floeck, 2009). A complete ultrasonographic examination of the liver and kidneys is supposed to give detailed information about the size, position, and ultrasonographic parenchymal pattern of the liver and kidneys. At present, there are no reports describing a technique for hepatic and renal biopsy under ultrasound guidance in adult camels and its safety. The purpose of this study was therefore to develop and verify the usefulness of a safe ultrasound-guided technique for biopsy of the hepatic and renal parenchyma in camels that can be used in veterinary practice and research.

## 2. Materials and methods

### 2.1. Animals and physical examination

Eighteen camels (*Camelus dromedarius*) (age:  $7.5 \pm 4.0$  years) were used in this study. Of the camels, 2 (11%) were males and 3 (17%) were 2–3 months pregnant, while the others were non-pregnant and non-lactating females. Camels underwent a thorough physical examination (Köhler-Rollefson et al., 2001) including general behavior and condition, auscultation of the heart, lungs, first stomach compartment and intestine, detection of heart and respiratory rates and rectal temperature. All camels were apparently healthy and they had full access to feed and water. Based on a 1 (very thin) to 5 (fat) scale, the body condition score (BCS) of camels was determined (Sghiri and Driancourt, 1999).

### 2.2. Preparation for biopsy

First, the foreleg of each camel was bent and tied with a rope on the carpal joint. The head was then held and the animal was pushed till lay in a position of sternal recumbency. The fore-and-hind legs were then tied by a rope near the carpal and hock joints, respectively. Both sides of thorax and abdomen were then clipped and skin shaved (Fig. 1). The shaved abdominal area was sterilized using standard surgical disinfection techniques. To obtain adequate restraint, camels were slightly sedated with xylazine (0.07 mg/kg BW, Bomazine 10%, Bomac Laboratories Ltd, New Zealand), and the region chosen for collecting hepatic or renal biopsy was infiltrated with 10 ml of 2% lidocaine hydrochloride. The experimental protocol has been accepted by the Animal Ethical Committee, Deanship for Scientific Research, Qassim University, Saudi Arabia.

### 2.3. Echo-assisted percutaneous biopsy of the liver and right and left kidneys

After application of a generous amount of alcohol to the skin, imaging of the liver and kidneys was performed using an ultrasound scanner (SSD-500, Aloka, Tokyo, Japan) equipped with a 3.5 MHz sector transducers. The liver and kidneys were firstly scanned to determine the optimal biopsy sites. After the application of transmission gel to the transducer, the liver was examined beginning at the right paralumbar fossa and extending forward to the 5th intercostal space (ICS). The right and left kidneys were examined at the upper right and caudal left paralumbar fossa.

Prior to biopsy, and under aseptic conditions, a small incision was made in the skin over the suggested biopsy site with the point of a scalpel

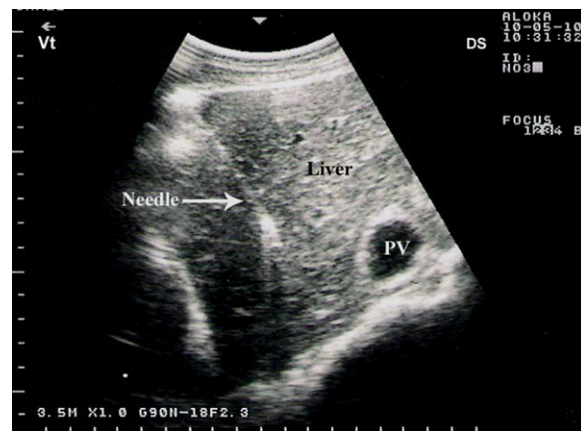


**Fig. 1.** A camel scheduled for liver biopsy. The animal was placed in a sitting position and both sides of the abdomen and thorax were clipped and skin shaved.

blade. Using a free-hand technique, a 14G × 150 mm spinal biopsy needle (Kurita Co., Ltd, Tokyo, Japan) was used. The biopsy needle was then advanced through the skin incision, and then under real-time ultrasound guidance toward the hepatic or renal parenchyma. During biopsy of the kidneys, advancement of the needle was halted when the tip of the needle was seen to penetrate the renal capsule. The needle was directed obliquely in an attempt to sample cortical tissue only and avoid the renal medulla, renal pelvis and hilar and renal vessels. When the needle was considered to be in the correct position, the plain stylet was withdrawn and a notched part was inserted and advanced 1 cm into the renal cortex beyond the renal capsule. Always the needle could be identified on the ultrasound within the hepatic parenchyma (Fig. 2) and renal cortex (Fig. 3) while the specimen was being obtained, thus confirming the location of the biopsy. Both the needle and forked stylet were then removed with a sample of hepatic or renal tissue. Repeat passes were performed, if required, to obtain sufficient biopsy specimens. Immediately after the procedure, the kidney was scanned to assess the presence of haematoma or active bleeding. All camels subjected to biopsy were kept under close observation for a period of 6 h post-procedure. This included hourly detection of heart and respiratory rates and rectal temperature, and visualizing the conjunctival mucus membranes.

### 2.4. Immediate effects of hepatic and renal biopsy

In this part of the study, 6 camels were used; 2 for liver biopsy, 2 for right kidney and 2 for left kidney biopsy. Hepatic and renal biopsies were carried out under ultrasound control and then the animal was slaughtered



**Fig. 2.** Hepatic biopsy in a camel. The needle is clearly visible within the hepatic parenchyma. PV: portal vein; Ds: dorsal; Vt: ventral.

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