

*Short communication*

LOCATIONS AND TECHNIQUES FOR PERCUTANEOUS  
RENAL BIOPSY IN ADULT DROMEDARY CAMELS  
(*CAMELUS DROMEDARIUS*)

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**Summary**

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The locations and techniques for performing renal biopsy in right and left kidneys of adult dromedary camels (*Camelus dromedarius*) were described. The topographical anatomy of the right and left kidneys was determined on 5 cadavres of adult healthy camels preserved with 10% formalin. Renal biopsies were performed on 10 adult healthy camels after sedation with 2% solution of xylazine hydrochloride (Rompun® 0.1 mg/kg, IV) and local anaesthesia with lidocaine hydrochloride at the biopsy sites. The exact sites of collecting renal biopsies from the right and left kidneys were described. At each site, ten attempts were performed and the percentages of successful and failed attempts were recorded. The results showed that the right kidney of the dromedary lied under the 2<sup>nd</sup> to 4<sup>th</sup> right transverse processes of the lumbar vertebrae whereas the left kidney was below the left transverse processes of the 5<sup>th</sup> to 7<sup>th</sup> lumbar vertebrae.

**Key words:** dromedary camel, percutaneous renal biopsy

The kidneys are firm, reddish-brown organs, located within a splitting of the sublumbar fascia and normally surrounded by peritoneal fat. In domestic animals, the right kidney is commonly found below the last rib and first two or three lumbar transverse processes, while the left one lies more caudally under the second to fourth lumbar vertebrae (Dyce *et al.*, 1987).

The primary functions of kidneys include maintenance of water and electrolyte balance, acid-base balance and excretion of end waste products such as urea, creatinine, and xenobiotics (Pratt, 1992;

Clark *et al.*, 1999).

In clinical practice, there are several methods to diagnose renal disorders. In general, they involve the evaluation of clinical history, physical examination, biochemical tests, image diagnostics and histopathologic examination of kidney biopsies. Laboratory tests and imaging are used to confirm the history and clinical signs as well as to assess the severity and to monitor the progress of renal disease in the course of treatment (Duncan *et al.*, 1994). Renal ultrasonography is a common noninvasive imaging technique used in determining certain morphologic chan-

ges in the kidney and as a guidance during performing renal biopsy (Finn-Badner, 1995).

The diagnosis of renal disease by means of histopathological evaluation of kidney tissue specimens is also very useful. Renal biopsy is usually performed to diagnose renal masses including renal tumors or to evaluate the extent of damage that has occurred to the kidney because of chronic disease. Renal biopsy can also assist in determining undiagnosed causes of renal failure. The procedure of collecting renal biopsy have been reported in domestic animal species such as horses (Orsini & Kreuder, 2002), cattle (Baird, 1999; Heller *et al.*, 2005), sheep (Belknap & Pugh, 2002), goats (Smith & Sherman, 1994), dogs and cats (Fossum, 1997; Vaden, 2005). The procedure of renal biopsy in dromedary camels has not been reported yet.

Therefore, the present study was carried out to describe the technique of performing percutaneous renal biopsy in the right and left kidneys of adult dromedary camels (*Camelus dromedarius*).

The topographical anatomy of both kidneys was determined on 5 cadavres of adult healthy camels preserved with 10% formalin solution as per Grossman's technique (Grossman, 1959). Kidney biopsy was collected from 10 adult (6–9 years-old) healthy camels. Each camel was sedated with 2% solution of xylazine hydrochloride (Rompun® 0.1 mg/kg, IV). While the animal was in a sitting position, the hair over the right and left flanks were shaved and the sites of kidney biopsy were aseptically prepared. The site of biopsy from the right kidney was 4 cm ventral to the 3<sup>rd</sup> right transverse process of the lumbar vertebrae. The site of biopsy from the left kidney was 5 cm ventral to the 6<sup>th</sup> left transverse process of the lumbar vertebrae. The respective sites

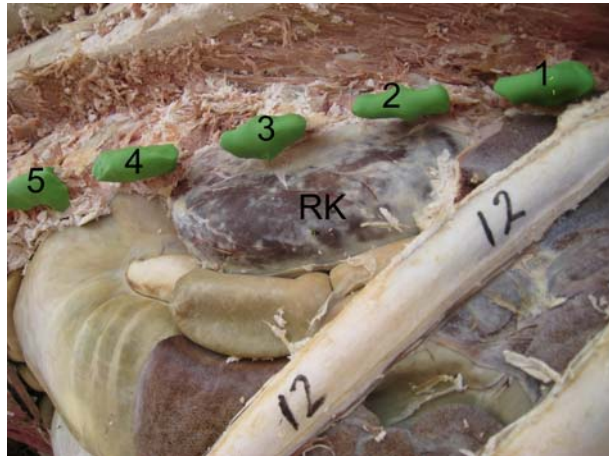
were locally infiltrated with lidocaine hydrochloride 2% (0.5–1 mL). A puncture of the skin was made over the determined position of collecting renal biopsy with a scalpel. A biopsy needle (Tru-Cut Biopsy Needle, Baxter Healthcare Corp., Valencia, CA, USA) was introduced and advanced ventromedially toward the opposite paralumbar fossa of the animal. At each site, 10 attempts of renal biopsies were performed and the success rate of attempts was recorded. After the renal biopsy, the skin puncture was sutured with a single interrupted suture using No. 0 silk, that was removed 14 days later.

The percentage of successful and failed attempts of renal biopsy from the right and the left kidneys were recorded. The analysis of variance (ANOVA) method was used to determine the difference between both kidneys at a level of significance  $P < 0.05$ .

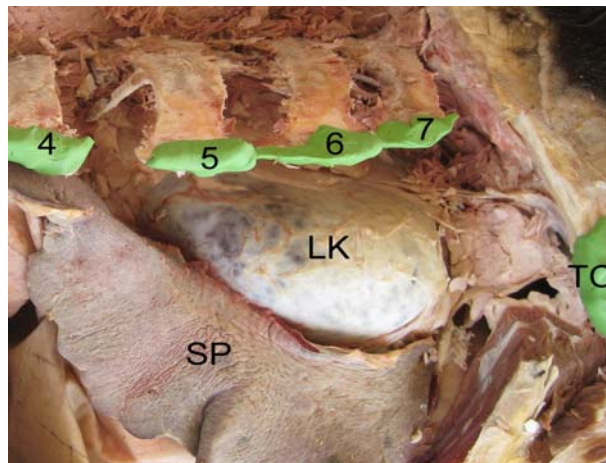
The kidneys of the dromedary camels are smooth, elliptically bean-shaped and the right kidney is more elongated than the left one. The right kidney lies under the 2<sup>nd</sup> to the 4<sup>th</sup> right transverse processes of the lumbar vertebrae (Fig. 1) and the left kidney – below the left transverse processes of the 5<sup>th</sup> to 7<sup>th</sup> lumbar vertebrae (Fig. 2).

Table 1 shows the sites of renal biopsy for both kidneys and success and failure rates for each site. The collection of renal biopsy was relatively easy from both kidneys in dromedary camels. The facility of performing renal biopsy from the left kidney was not significantly different from that of the right kidney.

The present study showed that the right kidney was positioned against the dorsal wall beneath the area from the cranial end of the transverse process of the 2<sup>nd</sup> to the cranial aspect of the 4<sup>th</sup> transverse process of the lumbar vertebrae in



**Fig. 1.** A photograph showing the location of the right kidney (*RK*) which lies under the 2<sup>nd</sup> to the 4<sup>th</sup> right transverse processes of the lumbar vertebrae. The numbers 1, 2, 3, 4, 5 are 1<sup>st</sup> to 5<sup>th</sup> right transverse processes of the lumbar vertebrae. The number 12 is the last rib.



**Fig. 2.** A photograph showing the location of the left kidney (*LK*) which lies under the left transverse processes of the 5<sup>th</sup> to 7<sup>th</sup> lumbar vertebrae. The numbers 4, 5, 6, 7 are 4<sup>th</sup> to 7<sup>th</sup> left transverse processes of the lumbar vertebrae; *SP* is the spleen, *TC* is the *tuber coxae*.

adult dromedary camels (Fig. 1). The location of the left kidney was against the dorsal wall below the left transverse processes of the last three lumbar vertebrae (from the 5<sup>th</sup> to the 7<sup>th</sup> lumbar vertebrae) (Fig. 2). Smuts & Bezuidenhout (1987) have reported similar results in both kidneys of adult dromedary camels.

Results obtained showed that performing renal biopsy from both kidneys in sitting position was relatively easy in dromedary camels, without any visible adverse effects from the procedure. The degree of difficulty of performing renal biopsy from the right kidney was approximately similar to that from the left

**Table 1.** Locations of renal biopsy in the right and left kidney of dromedary camels and the percentages (%) of successful and unsuccessful biopsy attempts for each site

Site of renal biopsy	Location	Successful attempts	Failed attempts
Right kidney	4 cm below the 3 <sup>rd</sup> right TPLV*	85%	15%
Left kidney	5 cm below the 6 <sup>th</sup> left TPLV*	80%	20%

\* TPLV: Transverse process of the lumbar vertebrae.

kidney.

In horses, renal biopsy from both the right and left kidneys can be performed blindly or using ultrasound guidance in a location between the 15<sup>th</sup> and 17<sup>th</sup> intercostals spaces ventral to the lumbar processes. (Orsini & Kreuder, 2002). Renal biopsy in adult cattle is performed from the right paralumbar fossa. The assistant palpates the left kidney via the rectum and positions the kidney against the right body wall (Baird, 1999). In the present study, renal biopsies were collected from the left kidneys of camels without need for performing rectal palpation. In goats, the preferred site for right kidney biopsy is in the anterior portion of the right paralumbar fossa just medial to the last rib (Smith & Sherman, 1994). In dogs and cats, renal biopsy can be performed via several methods: percutaneous techniques are usually performed with ultrasound guidance in both dogs and cats or blindly in cats (Vaden, 2005) whereas the keyhole technique can be used in dogs if ultrasound guidance is not available (Fossum, 1997; Vaden, 2005).

In humans (Nelson et al., 2001) and steers (Chiesa *et al.*, 2006), alternative procedures for performing renal biopsy such as ultrasound-guided, fluoroscopy-guided, laparoscopic and transjugular biopsies are also employed.

Several complications have been reported after performing renal biopsy in humans and animals. These include haemorrhage, haematuria and subcapsular

haematoma, infection and peritonitis (Belknap & Pugh, 2002; Orsini & Kreuder, 2002). None of these complications were seen in the present study provided that ultrasonography was not used to examine the kidney after the procedure and that urine samples were not microscopically tested for evidence of microscopic haematuria.

It was concluded that performing renal biopsy in sedated sitting dromedary camels was relatively easy from both the right and left kidneys. Any major complications were not observed after the percutaneous technique of renal biopsy.

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