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Comparative evaluation of ultrasound guided renal biopsy using 14 and 16 guage tru-cut biopsy needles in adult dogs

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Renal diseases are common in dogs and cats (Vaden, 2004). Renal biopsy is indicated when the results are likely to alter patient management by providing an accurate histological diagnosis or by facilitating prognostication (Minkus *et al.*, 1994). Dogs with glomerular disease or acute renal failure are likely candidates for renal biopsy to establish a definitive diagnosis and determine the severity of the lesion.

Ultrasound guided biopsy using 18 G spring loaded automatic core biopsy needle has been successfully used in dogs (Groman *et al.*, 2004). The present study involved comparative evaluation of ultrasound guided renal biopsy using 14 and 16 G tru-cut biopsy needles in adult dogs.

Seventeen mongrel dogs of either sex in the age group of 1-7 years with mean body weight of 18.23 kg (range 10-26 kg) were randomly allotted to group I (n=12, 9 males and 3 females) and group II (n=5, 3 males and 2 females). Ultrasound guided renal biopsy was performed in groups I and II using 16 and 14 G tru-cut biopsy needles (Fig. 1), respectively. All dogs were fasted overnight and para-costal region on either side was prepared for aseptic intervention. The animals were pre-medicated with acepromazine HCl (0.05 mg/kg b.wt i.m.) and pre-biopsy urine and blood samples were collected. General anaesthesia was induced with a mixture of Ketamine HCl (10 mg/kg b.wt) and diazepam (0.5 mg/kg b.wt) given intravenously (Haskins *et al.*, 1986). Additional doses were given as required. The animals were hydrated with lactated Ringers solution 10 mL/kg b.wt.

After induction of anaesthesia the animals were secured in right lateral position for left kidney and *vice-a-versa*. Para-costal region was scanned with 5.0 MHz mechanical sector transducer with B-mode. Transducer placement was such that the caudal pole of the kidney, which was selected for biopsy could be visualized easily. In group I, automatic spring loaded 16 G tru-cut biopsy needle (BARD Biopsy Cut, C.R. Bard Inc., Covington, GA) (length 16 cm and specimen notch 1.7 cm) was then placed through a guide. A small nick with B.P. blade 21 was made on skin before the entry of needle and advanced towards kidney while visualizing on the monitor (Fig. 2). After ensuring proper needle placement and activation, needle was withdrawn from abdomen and the tissue was collected from the specimen notch directly on the tissue paper to be immersed in 10% formalin for histological studies. In group II, 14 G 'tru-cut biopsy needle (length 15 cm and specimen notch 2 cm) was used for renal biopsy.

Immediately after biopsy and 48 hr post-biopsy blood samples were collected. Dogs were administered Inj. Cefotaxime 20 mg/ kg b.wt i.m. for 4 days. The blood samples were analyzed for routine biochemical parameters and blood gases, while urine sample were analyzed for electrolytes and enzymes. Histological evaluation involved haematoxylin and eosin staining of 2 to 3 µm thick sections for tissue type and quality.

Under post-biopsy clinical observations, general health, appetite, water intake and urination were found normal in all 17 animals. The anaesthetic protocol was found adequate with uncomplicated recovery. Following renal biopsy in most dogs, post-biopsy oozing of blood was evident for short duration. Complications mainly, immediate bleeding at the biopsy site was observed in 1.2% dogs by Leveille *et al.* (1993), while Bigge *et al.* (2001) observed bleeding complications mainly in dogs with thrombocytopenia.

Renal images following ultrasound were typical with cortex having intermediate echogenicity and medulla hypoechoic and pelvis highly echogenic. The needle was seen parallel to

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Fig. 1: Introducing biopsy needle (arrow).

Fig. 2: Ultrasound image of kidney with needle.

the dotted line in hyperechoic image. Similar findings were reported using 5.0 MHz mechanical sector transducer in dogs (Powis, 1978).

In 17 mongrel dogs, haematological and biochemical values on 1, 3 and 7 days post-biopsy were within normal range, although total leukocyte count and neutrophil count on the day after biopsy increased. Urine analysis showed microscopic haematuria during 3rd day after biopsy (Kaya *et al.* 2002). While Groman *et al.* (2004) reported no detectable change of GFR in biopsied kidneys. The urine analysis in both the groups recorded non-significant variations in urine pH and specific gravity, urine creatinine, urinary sodium and protein as well as urine-protein/urine-creatinine ratio and urinary fractional excretion of sodium, after biopsy.

The plasma electrolytes such as sodium and chloride in group II and potassium in group I revealed a significant ($P<0.05$) decrease and increase at 48 hr post-biopsy, respectively. The urinalysis in both the groups recorded non-significant variation in urine pH and specific gravity, urine creatinine, urinary sodium and protein as well as in urine protein/ urine creatinine ratio and urinary fractional excretion of sodium after biopsy.

The histological findings revealed that the samples obtained using 16 G needle (group I) yielded an average of 10.77 numbers of glomeruli per sample while the samples using 14 G needle (group II) yielded an average of 7.75 number of glomeruli per sample. The cell morphology in both the groups was found to be normal. The average size of the biopsy sample obtained using 16 G needle (group I) was 1 x 0.1 cm and with 14 G needle (group II) was 0.75 x 0.1 cm. The length of biopsy sample varies due to different factors like distance of needle point from the kidney while shooting, the skill of individual and technique used. Leveille *et al.* (1993) obtained 1.7 x 0.1 cm of renal tissue using 18 G needle. In the present study in 2 cases each there was either only medulla or no renal tissue was present. The medulla content obtained in samples using 16 G needle (group I) was 5 to 70%, while 14 G needle (group II) biopsy samples were found to have 70, 50, 30 and 20% of medulla.

Samples were analyzed histologically for crushing and fragmentation of tissue obtained. One sample revealed crushing using 16 G needle (group I), while four samples obtained using 14 G needle (group II) were found to have either crushing (1), fragmentation (1) or both (2).

The biopsy samples in group I had 11.11% crushing and/or fragmentation, which is lower than 70% reported by Rawlings *et al.* (2003) in dogs, while in group II, 100% crushing and fragmentation were seen, which was higher than 37.5% recorded by Rawling *et al.* (2003) in dogs.

In the present study, adequate samples were obtained in 76.5% biopsy tissue indicating the accuracy of the technique. While Hager *et al.* (1985) and Barr (1995) reported 88 and 83% of accuracy, respectively. However, De Rycke *et al.* (1999) and Kaya *et al.* (2002) reported 53.5 and 60% accuracy, respectively.

Two samples revealed only medulla on histological evaluation, also recorded by Nash (1983), which may be due to deep penetration of

biopsy needle. Two samples (11.76%) had no renal tissue, while De Rycke *et al.* (1999) observed no renal tissue in 18% of samples. In group I (16 G needle) average number of glomeruli obtained was 10.77, which is similar to the results of 18 G needle obtained in human patients (Song and Cronan, 1998). In group II (14 G needle), average number of glomeruli per sample was 7.75, while Hopper *et al.* (1993) found 8.11.

Thus, the present study advocates ultrasound guided renal biopsy using 16 G tru-cut biopsy needle as it yielded adequate quality biopsy sample, cell morphology and number of glomeruli.

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